NVIDIA.

FCC Authorization

28 June 2016

FEDERAL COMMUNICATIONS COMMISSIONS
Authorization and Evaluation Division
7435 Oakland Mills Road
Columbia, MD 21046

Subject: Agent Authorization

To whom it may concern:

We NVIDIA Corporation, the undersigned, Hereby authorize UL Verification Services Inc. to act on our behalf in all matters relating to application for Equipment authorization, including the signing of all documents relating to these matters, of the following product:

Product description: Portable Gaming Device
Type designation: P2523
FCC ID: VOB-P2523
Trademark: NVIDIA

All acts carried out by UL Verification Services Inc. on our behalf shall have the same effect as our own action.

We, the undersigned, hereby certify that we are not subject to a denial of federal benefits, that includes FCC benefits, pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. § 862. Further, no party, as defined in 47 CFR 1.2002(b), to the application is subject to denial of federal benefits, that include FCC benefits.

This authorization expires one year from the date of this letter. We reserve all rights to terminate the authorization and the appointment under this Letter by reasonable prior notice to you.

Sincerely Yours,

Charles Jackson
Compliance Engineering Manager
NVIDIA Corporation

NVIDIA.

28 June 2016

FEDERAL COMMUNICATIONS COMMISSIONS
Authorization and Evaluation Division
7435 Oakland Mills Road
Columbia, MD 21046

Subject: Request for Confidentiality regarding application for FCC ID: VOB-P2523.

To Whom It May Concern,

Pursuant to the provisions of 47 CFR Sections 0.457 and 0.459 of Commission's rules, NVIDIA Corporation hereby requests the Commission withhold the following attachments as confidential document from public disclosure indefinitely.

- Operational Description
- Block Diagram
- Schematic Diagram
- Parts List

In addition to the above mentioned documents, pursuant to Public Notice DA 04-1705 of the Commission's policy, in order to comply with the marketing regulations in 47 CFR §2.803 and the importation rules in 47 CFR §2.1204, while ensuring that business sensitive information remains confidential until the actual marketing of newly authorized devices, NVIDIA Corporation also requests the commission to grant short-term confidentiality of the following attachments for 180 days after the Grant Date of Equipment Authorization.

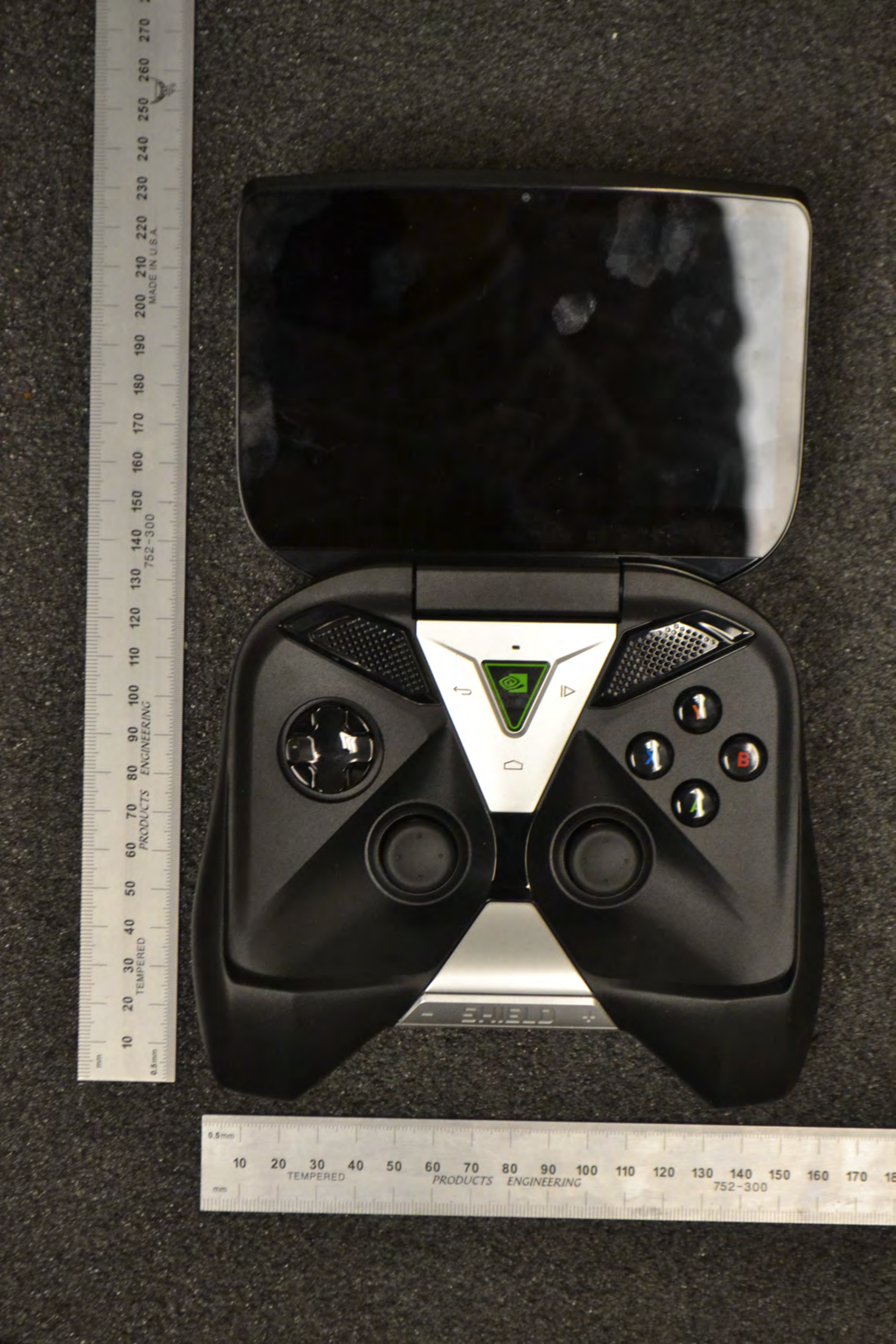
- User's Manual
- Internal Photos
- External Photos
- Test Set-up Photos

The above mentioned documents contain detailed system and equipment descriptions which are considered proprietary and confidential information. Public disclosure of these documents may be harmful to our company and would provide competitors an unjustified advantage in the market.

Sincerely,

Charles Jackson
Compliance Engineering Manager
NVIDIA Corporation

2701 San Tomas Expressway | Santa Clara, CA 95050 | T 408.486.2000 | F 408.486.2200 | www.nvidia.com


SHIELD
TEMPERED
PRODUCTS ENGINEERING
752-300
MADE IN U.S.A.
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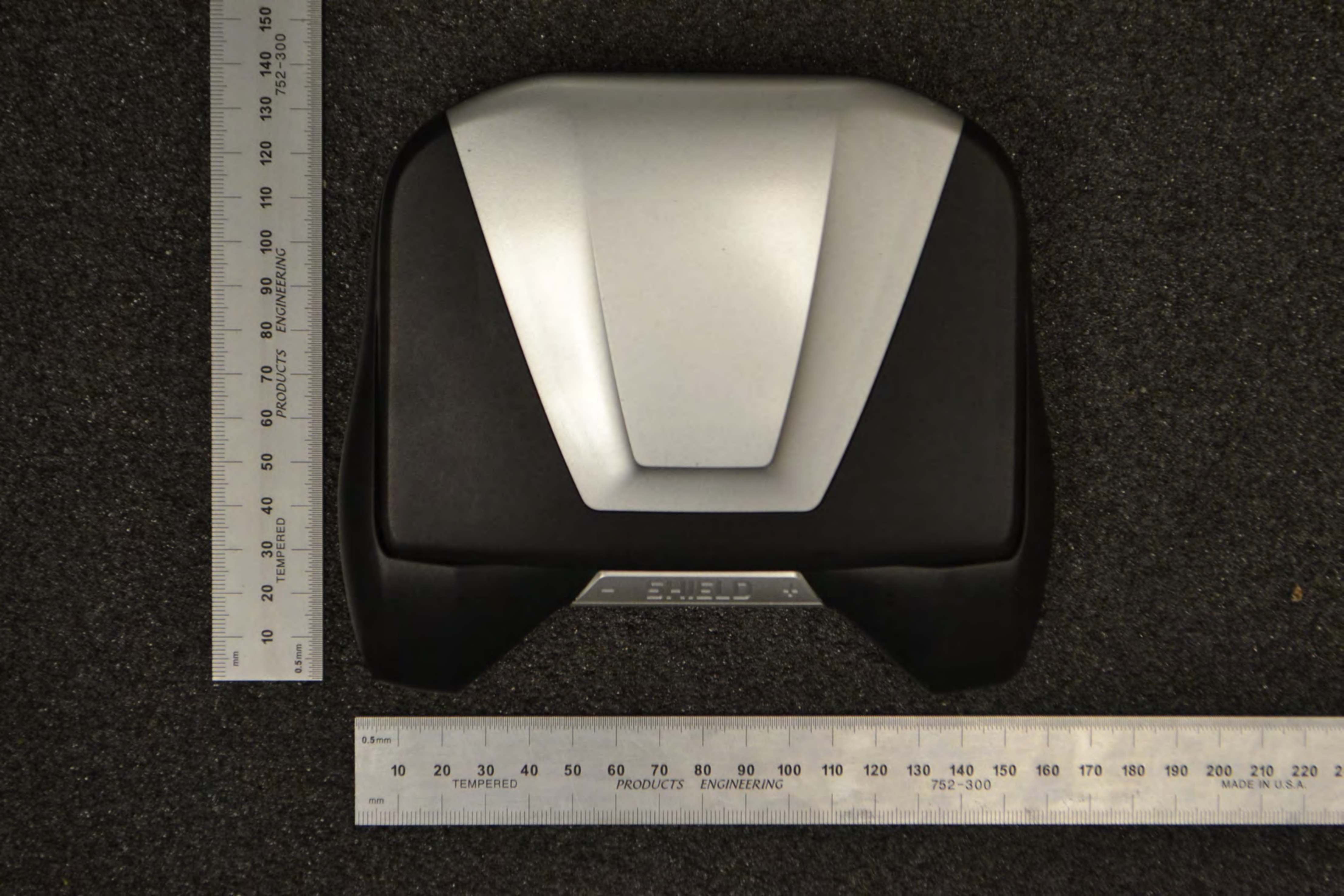
B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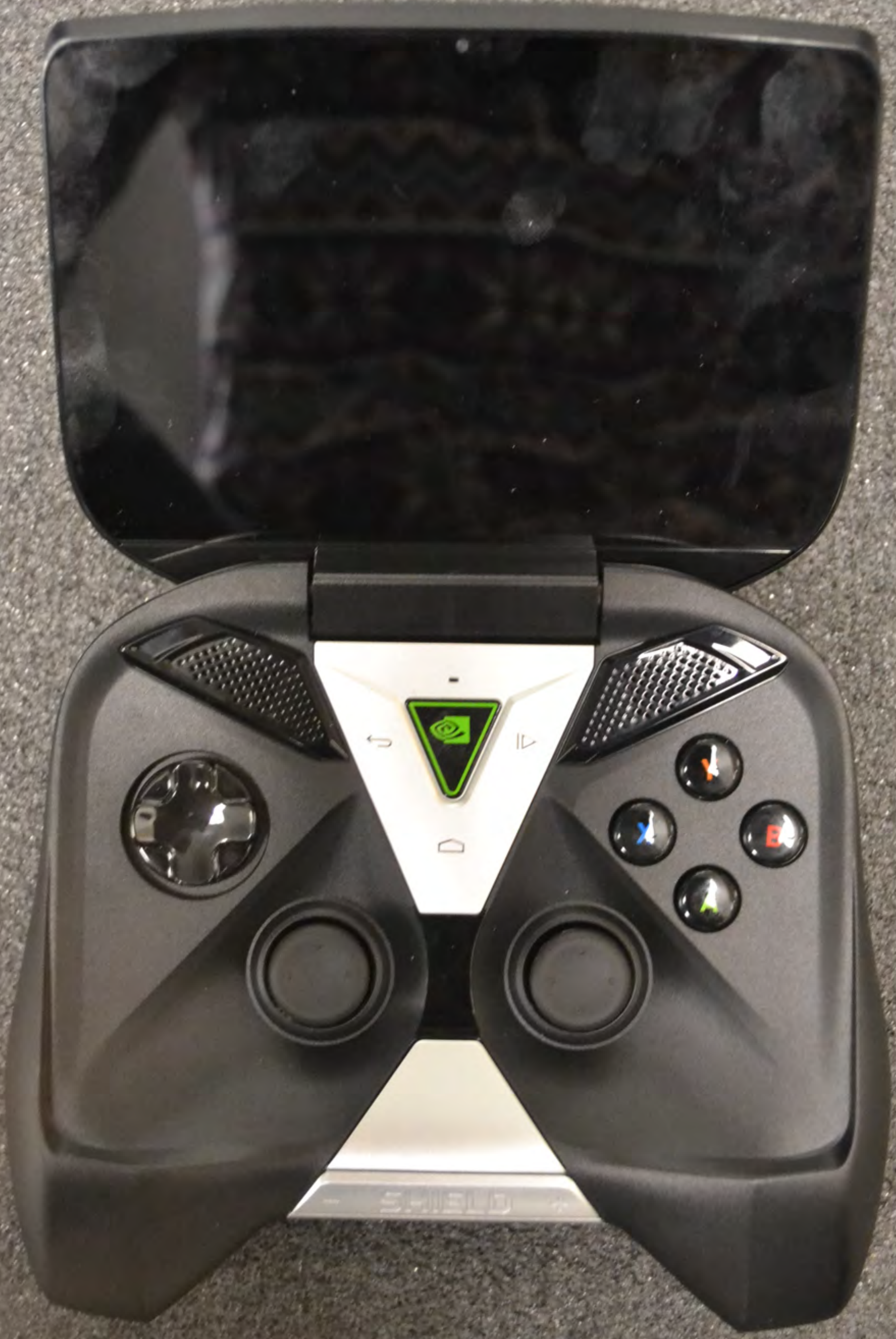
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SHIELD
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SHIELD

Not for sale, for development only
非卖品，限用于产品研发
S/N: P2523-E02-S0928

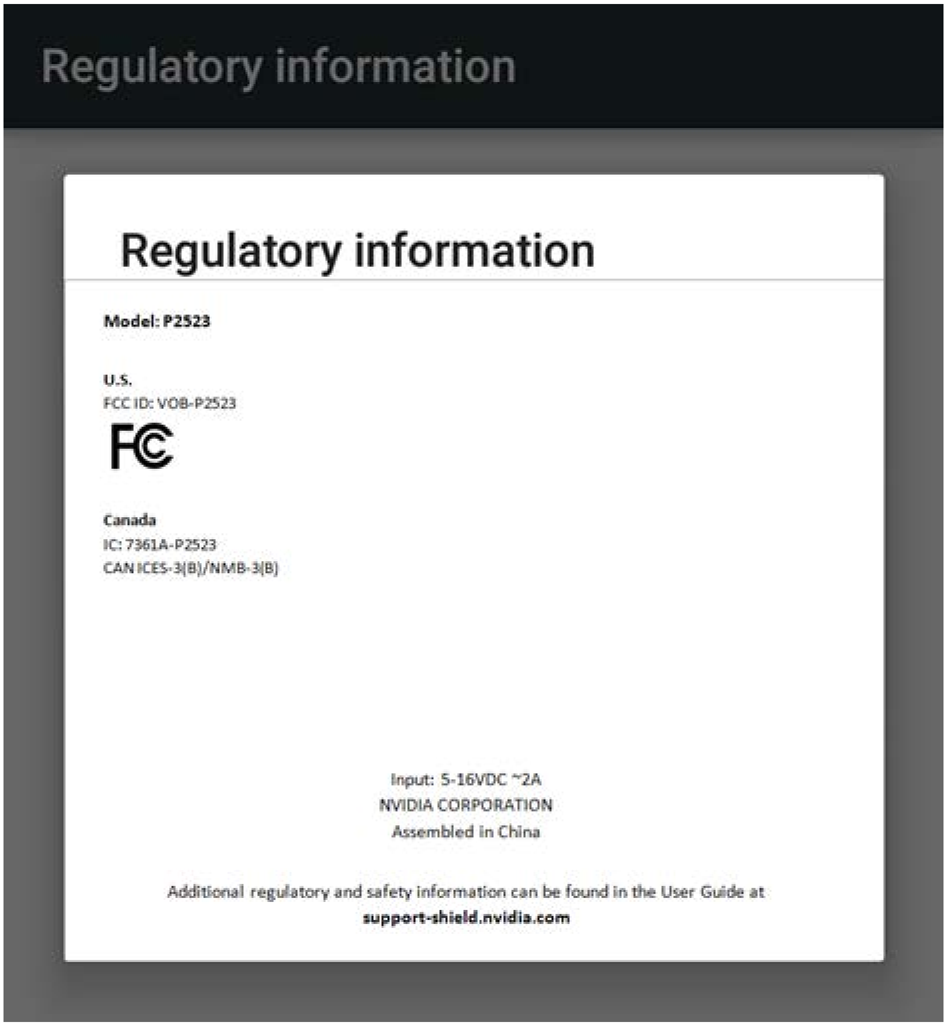
Electronic Label Exhibit
FCC ID: VOB-P2523

The NVIDIA Model P2523 utilizes an Electronic Label, in-lieu of a physical label, to present required regulatory label information. This electronic label is programmed into the software image and installed at the factory. The user does not have the ability to access or modify the information.

The information that will be displayed on the e-label and information that will remain in the user manual is shown below:

Information	on E-label	on Product Packaging	In On-Line Manual
FCC ID number	X	X	
DoC logo	X	X	
15.19 statement (“*This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.*”)			X
Class B Digital Device user manual/compliance statements			X
Caution to the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment			X

An example of the e-label screen is provided below:



Regulatory information

Regulatory information

Model: P2523

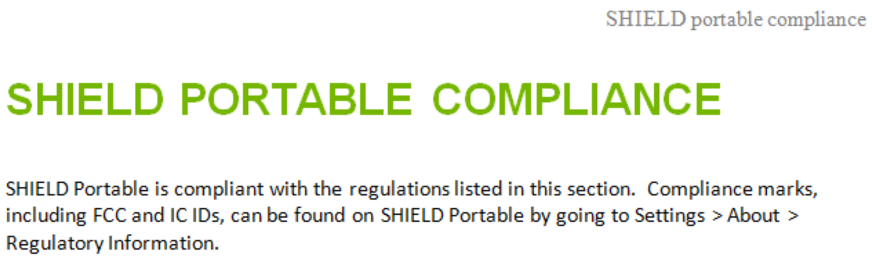
U.S.
FCC ID: VOB-P2523

Canada
IC: 7361A-P2523
CAN ICES-3(B)/NMB-3(B)

Input: 5-16VDC ~2A
NVIDIA CORPORATION
Assembled in China

Additional regulatory and safety information can be found in the User Guide at
support-shield.nvidia.com

The electronic label is easily accessible to the user from the settings menu. Specific instructions on how to access the information is provided in the Legal/Compliance section of the user guide (see below).

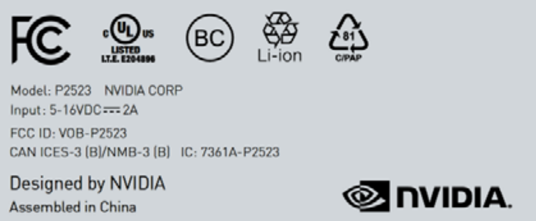


SHIELD portable compliance

SHIELD PORTABLE COMPLIANCE

SHIELD Portable is compliant with the regulations listed in this section. Compliance marks, including FCC and IC IDs, can be found on SHIELD Portable by going to Settings > About > Regulatory Information.

To meet importation, marketing and sales requirements, the UPC label on the packaging contains all applicable regulatory information. An example of the UPC label is provided below.



Model: P2523   NVIDIA CORP
Input: 5-16VDC ⎓ 2A
FCC ID: VOB-P2523
CAN ICES-3 (B)/NMB-3 (B)   IC: 7361A-P2523
Designed by NVIDIA
Assembled in China

14U19497
UL
mm
0.5mm
MADE IN CHINA
EF-24 94V0
HOSIDEN
4106K

14U19497
699-12530-0031-B0
0374714 Made in USA
S/N: P2530-E03-P0042
mm
0.5 mm

14U19497

S/N: P2530-E03-P0042
699-12530-0031-B00 D.2
037414 Made in USA
DA201652
EMC Certification Pending
NOT FOR ENV. COMPLIANCE TEST
RoHS Compliant
180-12530-DAAD-E03
HF
13492
14U19497

14U19497
ES SEC 437 K4F6E30 4HAMGCH
HF
180-12530-DAAD-E03
13492
R22
R22
1R0
R005

14U19497
94V0 EF-44214(01)
PCB MADE IN HONG KONG
180-12531-DABA-D06
RoHS COMPLIANT
HF
A
B
X
Y
PU S2
PR S4
PD S3
PL S1
HALL
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0334314000348
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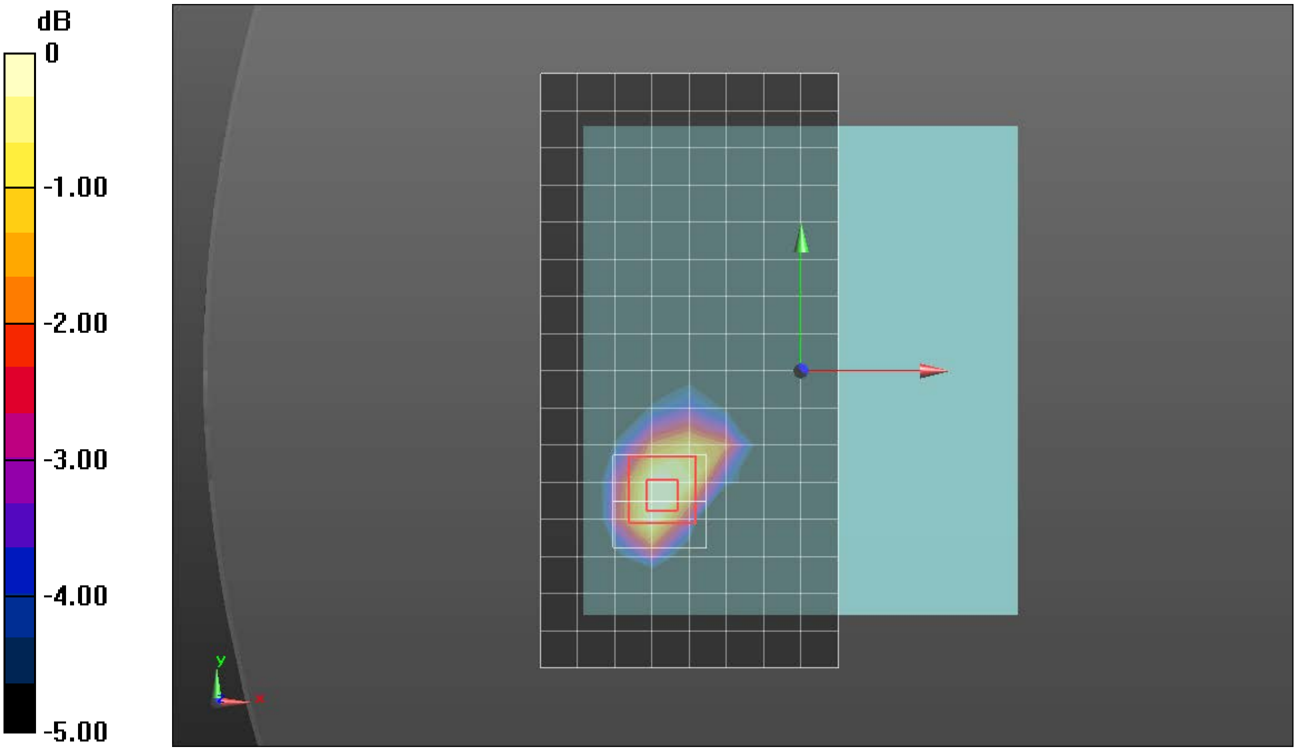
Test Laboratory: UL Verification Services Inc., SAR Lab 1 Date/Time: 12/9/2014 5:55:13 PM

Wi-Fi 2.4GHz

Frequency: 2462 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used (interpolated): f = 2462 MHz; σ = 2.029 S/m; ε_r = 50.835; ρ = 1000 kg/m^3
DASY5 Configuration:
- Area Scan Setting: Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE3 Sn427; Calibrated: 1/21/2014
- Probe: EX3DV4 - SN3902; ConvF(7.35, 7.35, 7.35); Calibrated: 5/19/2014;
- Sensor-Surface: 2.5mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: ELI-B v5.0; Type: QDOVA002AA; Serial: TP:1195

Rear/ANT 1_802.11b_ch 11/Area Scan (9x17x1): Measurement grid: dx=12mm, dy=12mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.179 W/kg

Rear/ANT 1_802.11b_ch 11/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.216 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 0.253 W/kg
SAR(1 g) = 0.132 W/kg; SAR(10 g) = 0.070 W/kg
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.177 W/kg



0 dB = 0.177 W/kg = -7.52 dBW/kg

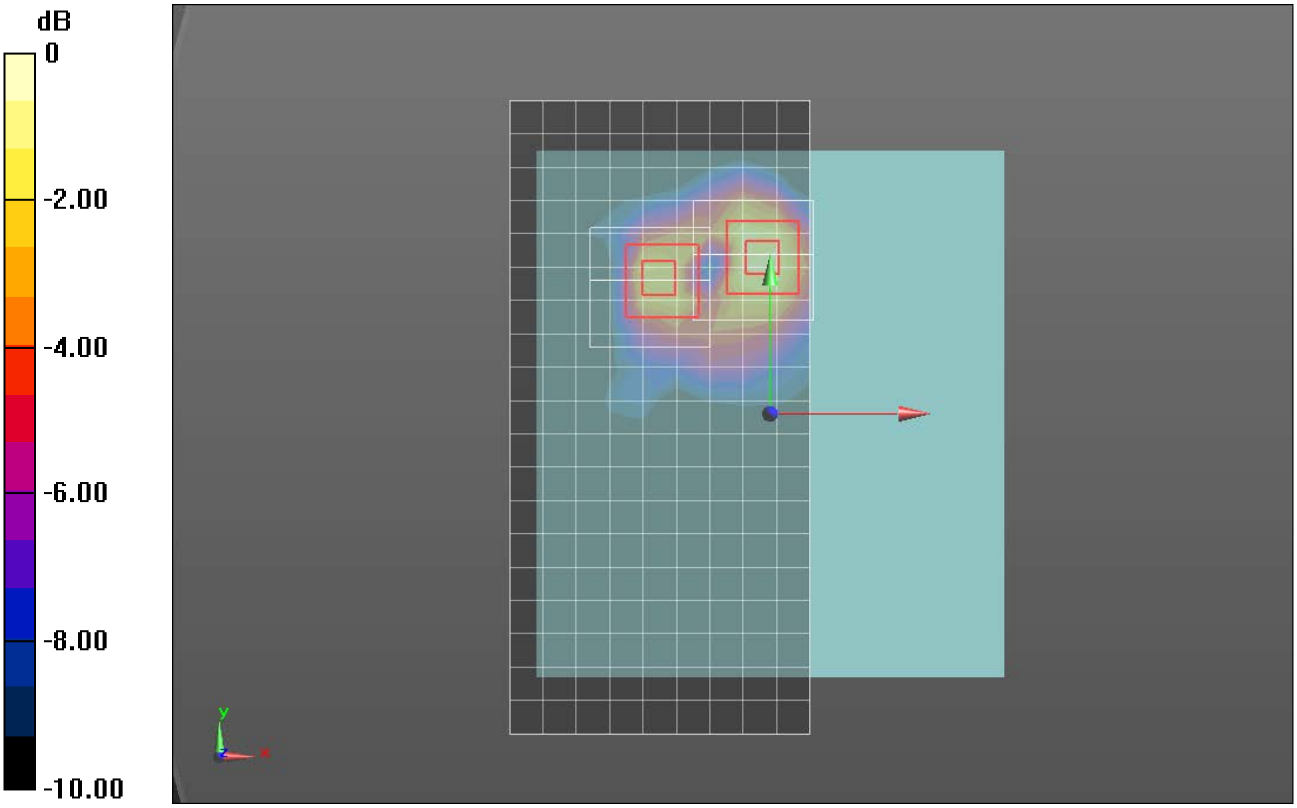
Wi-Fi 5GHz

Frequency: 5210 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used: f = 5210 MHz; σ = 5.443 S/m; ε_r = 46.961; ρ = 1000 kg/m^3
DASY5 Configuration:
- Area Scan Setting: Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn1439; Calibrated: 5/14/2014
- Probe: EX3DV4 - SN3991; ConvF(4.66, 4.66, 4.66); Calibrated: 5/16/2014;
- Sensor-Surface: 2.5mm (Mechanical Surface Detection), Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: ELI v5.0 (B); Type: QDOVA002AA; Serial: TP:1257

Rear/ANT 2_802.11ac HT80_ch 42/Area Scan (10x20x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.629 W/kg

Rear/ANT 2_802.11ac HT80_ch 42/Zoom Scan (10x10x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 11.52 V/m; Power Drift = 0.10 dB
Peak SAR (extrapolated) = 1.57 W/kg
SAR(1 g) = 0.457 W/kg; SAR(10 g) = 0.177 W/kg
Maximum value of SAR (measured) = 0.834 W/kg

Rear/ANT 2_802.11ac HT80_ch 42/Zoom Scan 2 (10x10x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 11.52 V/m; Power Drift = 0.10 dB
Peak SAR (extrapolated) = 1.50 W/kg
SAR(1 g) = 0.397 W/kg; SAR(10 g) = 0.126 W/kg
Maximum value of SAR (measured) = 0.770 W/kg



0 dB = 0.770 W/kg = -1.14 dBW/kg

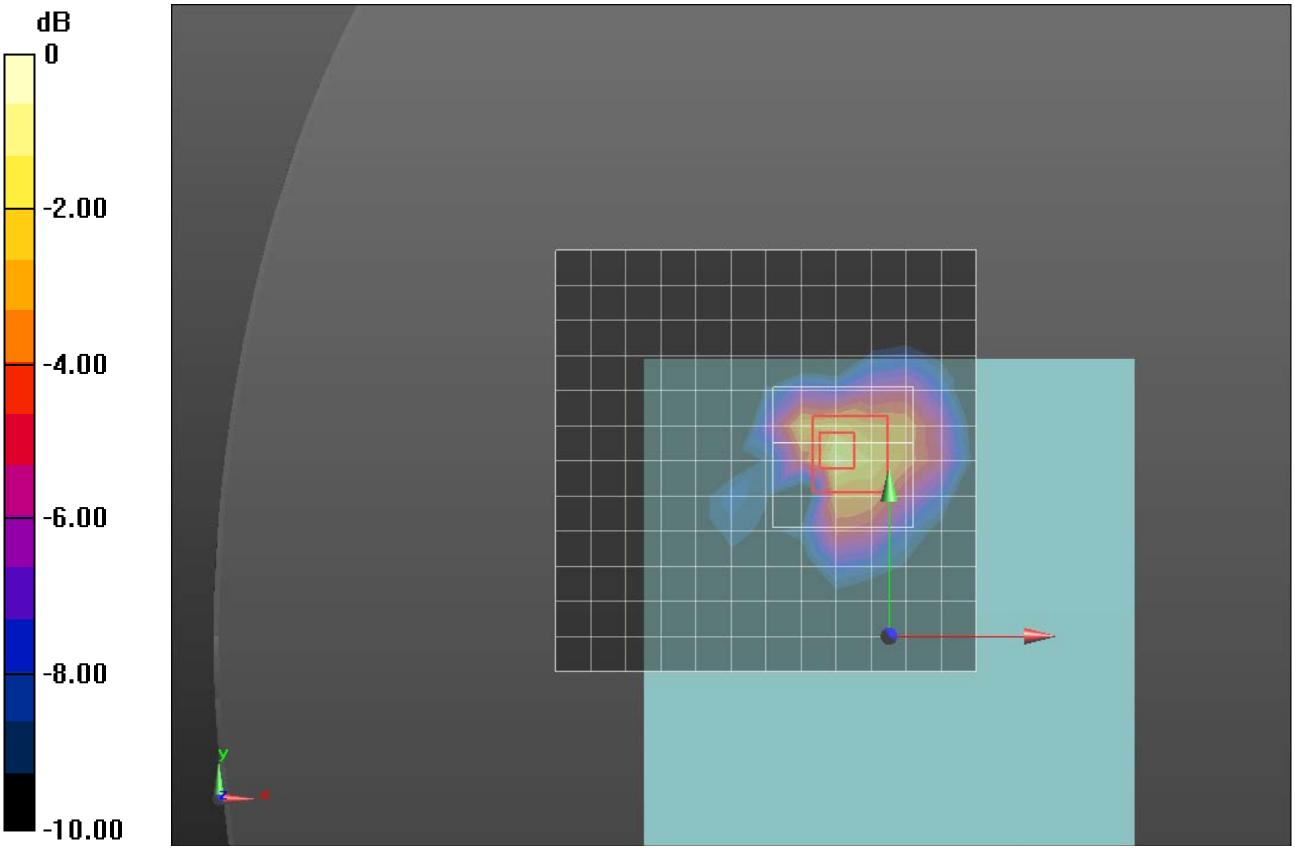
Test Laboratory: UL Verification Services Inc., SAR Lab 5 Date/Time: 12/9/2014 10:26:52 PM

Wi-Fi 5GHz

Frequency: 5775 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used: f = 5775 MHz; $\sigma = 6.206$ S/m; $\varepsilon_r = 46.003$; $\rho = 1000$ kg/m^3
DASY5 Configuration:
- Area Scan Setting: Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn1439; Calibrated: 5/14/2014
- Probe: EX3DV4 - SN3991; ConvF(4.32, 4.32, 4.32); Calibrated: 5/16/2014;
- Sensor-Surface: 2.5mm (Mechanical Surface Detection), Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: ELI v5.0 (B); Type: QDOVA002AA; Serial: TP:1257

Rear/ANT 2_802.11ac VHT80_ch 155/Area Scan (13x13x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.575 W/kg

Rear/ANT 2_802.11ac VHT80_ch 155/Zoom Scan (11x11x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 10.38 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 1.54 W/kg
SAR(1 g) = 0.382 W/kg; SAR(10 g) = 0.140 W/kg
Maximum value of SAR (measured) = 0.734 W/kg



0 dB = 0.734 W/kg = -1.34 dBW/kg

SAR EVALUATION REPORT

FCC 47 CFR § 2.1093
IEEE Std 1528-2013

For
Portable Gaming Device

FCC ID: VOB-P2523
Model Name: P2523

Report Number: 14U19497-S1E
Issue Date: 7/12/2016

Prepared for
NVIDIA
2701 SAN TOMAS EXPY
SANTA CLARA, CA 95050

Prepared by
UL Verification Services Inc.
47173 Benicia Street
Fremont, CA 94538, U.S.A.
TEL: (510) 771-1000
FAX: (510) 661-0888

NVLAP LAB CODE 200065-0

Revision History

Rev.	Date	Revisions	Revised By
--	12/31/2014	Initial Issue	--
A	1/7/2015	Section 7: Added Note(s) section	Coltyce Sanders
B	2/27/2015	Section 2: Added KDB 941225 D07 test standard	Coltyce Sanders
C	3/3/2015	Section 7: Added reference to KDB enquiry, deleted notes.	Dave Weaver
D	7/6/2016	Section 1: Updated FCC ID Section 2: Removed TCB workshop note Section 4.3: Updated Table	Coltyce Sanders
E	7/12/2016	Section 2: Updated KDB List	Coltyce Sanders

Table of Contents

1. Attestation of Test Results 5

2. Test Specification, Methods and Procedures 6

3. Facilities and Accreditation 7

4. SAR Measurement System & Test Equipment 8

4.1. SAR Measurement System 8

4.2. SAR Scan Procedures 9

4.3. Test Equipment 11

5. Measurement Uncertainty 11

6. Device Under Test (DUT) Information 12

6.1. DUT Description 12

6.2. Wireless Technologies 12

6.3. Nominal and Maximum Output Power 13

7. RF Exposure Conditions (Test Configurations) 14

8. Dielectric Property Measurements & System Check 14

8.1. Dielectric Property Measurements 14

8.2. System Check 16

9. Conducted Output Power Measurements 18

9.1. Wi-Fi DTS (2.4 GHz) Band 18

9.2. Wi-Fi U-NII (5 GHz) Bands 19

9.3. Bluetooth 20

10. Measured and Reported (Scaled) SAR Results 21

10.1. Wi-Fi (DTS Band) 22

10.2. Wi-Fi (U-NII Band) 22

10.3. Bluetooth 23

11. SAR Measurement Variability 24

12. Simultaneous Transmission SAR Analysis 25

12.1. Sum of the SAR Wi-Fi & BT 25

Appendixes 26

A_14U19497-S1v0 SAR Photos & Ant. Locations 26

B_14U19497-S1v0 SAR Highest SAR Test Plots 26

C_14U19497-S1v0 SAR System Check Plots 26

D_14U19497-S1v0 SAR Tissue Ingredients 26
E_14U19497-S1v0 SAR Probe Cal. Certificates 26
F_14U19497-S1v0 SAR Dipole Cal. Certificates 26

1. Attestation of Test Results

Applicant Name	NVIDIA
FCC ID	VOB-P2523
Model Name	P2523
Applicable Standards	FCC 47 CFR § 2.1093 Published RF exposure KDB procedures IEEE Std 1528-2013

SAR Limits (W/Kg)

Exposure Category	Peak spatial-average (1g of tissue)	Extremities (hands, wrists, ankles, etc.) (10g of tissue)
General population / Uncontrolled exposure	1.6	4

The Highest Reported SAR (W/kg)

RF Exposure Conditions	**Equipment Class**			
	Licensed	**DTS**	**U-NII**	**DSS (BT)**
Extremity (10g)	NA	0.094	0.250	NA
Simultaneous Tx		0.141	0.303	

Date Tested	12/4/2014 to 12/10/2014
Test Results	Pass

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government (NIST Handbook 150, Annex A). This report is written to support regulatory compliance of the applicable standards stated above.

Approved & Released By:	Prepared By:
Devin Chang Senior Engineer UL Verification Services Inc.	Coltyce Sanders Laboratory Engineer UL Verification Services Inc.

2. Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEEE STD 1528-2013, the following FCC Published RF exposure KDB procedures:

- 248227 D01 SAR Meas for 802 11abg v02r02
- 447498 D01 General RF Exposure Guidance v06
- 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04
- 865664 D02 RF Exposure Reporting v01r02
- 941225 D07 UMPC Mini Tablet v01r02

3. Facilities and Accreditation

The test sites and measurement facilities used to collect data are located at

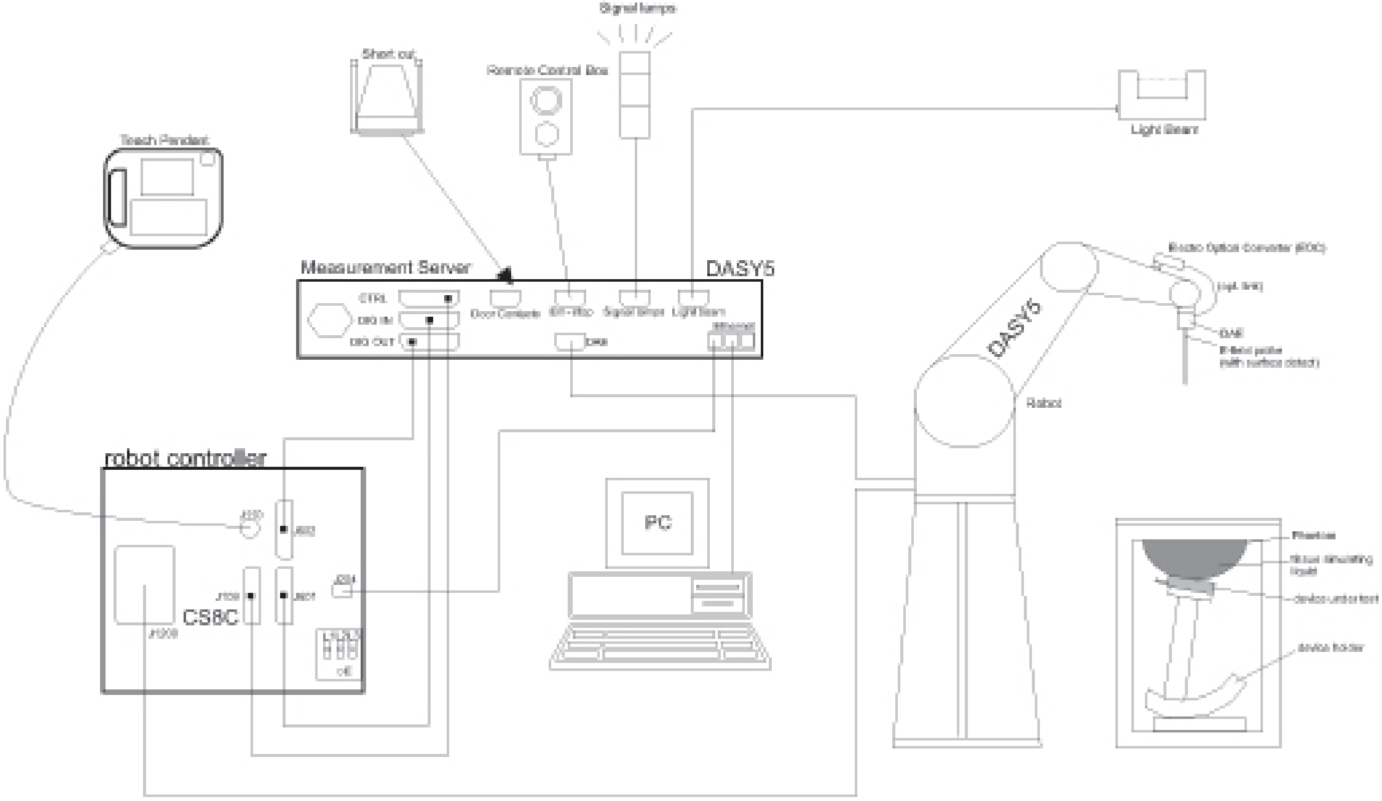
47173 Benicia Street	47266 Benicia Street
SAR Lab A	SAR Lab 1
SAR Lab B	SAR Lab 2
SAR Lab C	SAR Lab 3
SAR Lab D	SAR Lab 4
SAR Lab E	SAR Lab 5
SAR Lab F	
SAR Lab G	
SAR Lab H	

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0.

4. SAR Measurement System & Test Equipment

4.1. SAR Measurement System

The DASY5 system used for performing compliance tests consists of the following items:



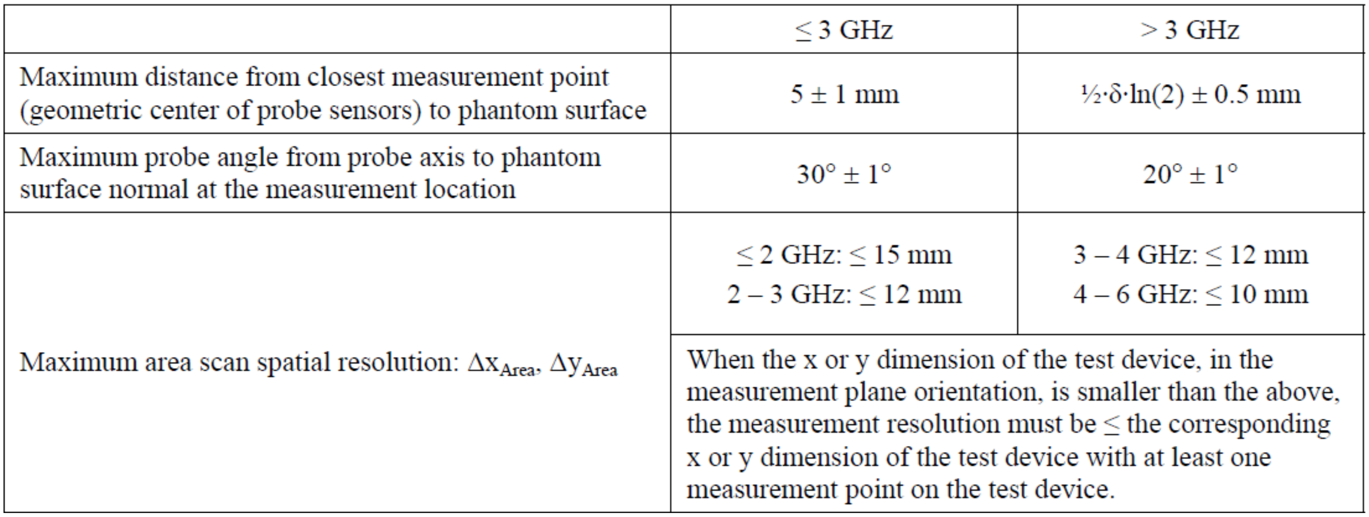
- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP or Win7 and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

4.2. SAR Scan Procedures

Step 1: Power Reference Measurement
The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 2.1 mm. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

Step 2: Area Scan
The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE Standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan). If only one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of Zoom Scans has to be increased accordingly.

Area Scan Parameters extracted from KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

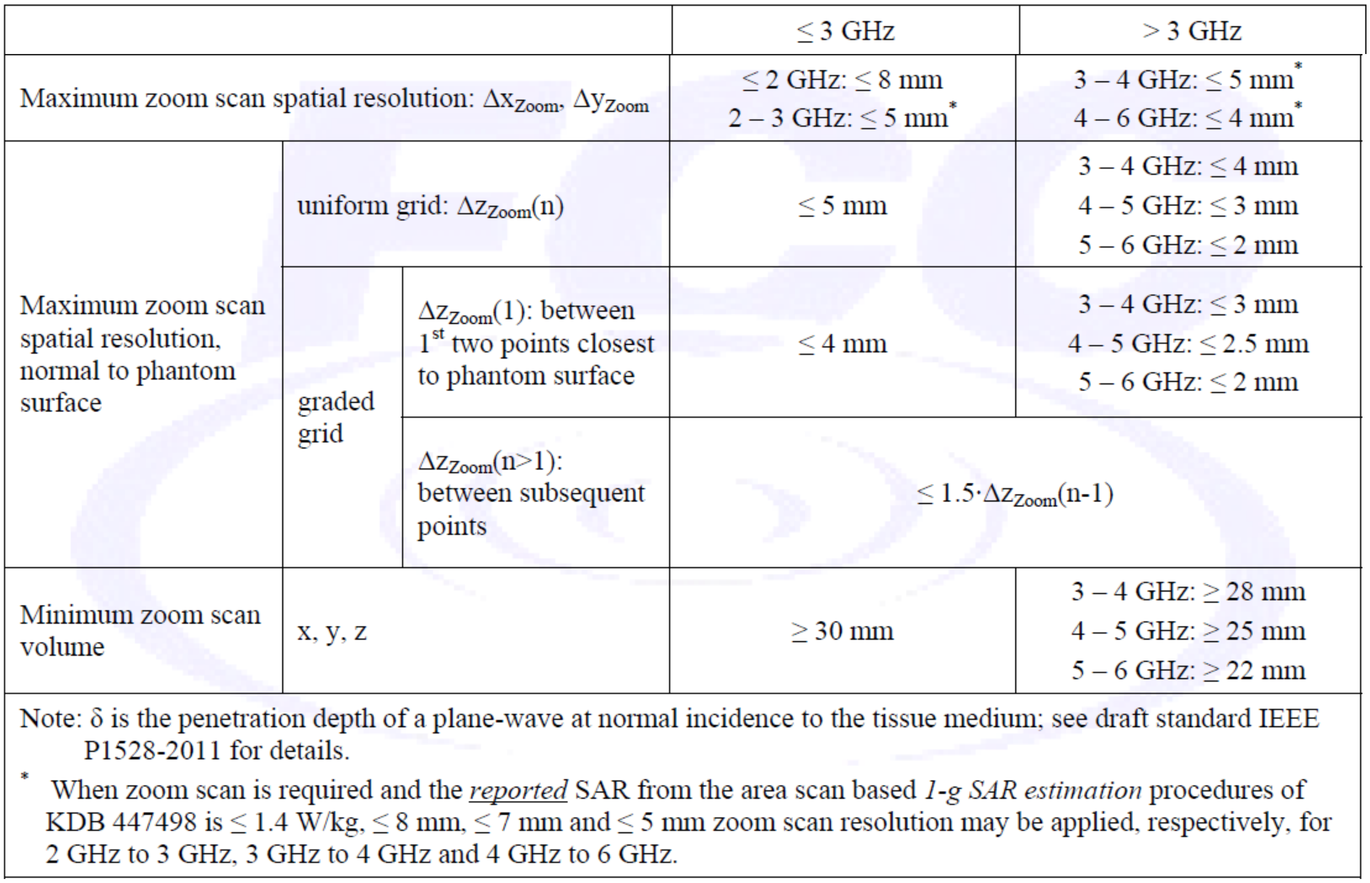


	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

Step 3: Zoom Scan

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The Zoom Scan measures points (refer to table below) within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the Zoom Scan evaluates the averaged SAR for 1 g and 10 g and displays these values next to the job's label.

Zoom Scan Parameters extracted from KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz



			≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	≤ 1.5·$\Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.

* When zoom scan is required and the *reported* SAR from the area scan based *1-g SAR estimation* procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

Step 4: Power drift measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

Step 5: Z-Scan

The Z Scan measures points along a vertical straight line. The line runs along the Z-axis of a one-dimensional grid. In order to get a reasonable extrapolation the extrapolated distance should not be larger than the step size in Z-direction.

4.3. Test Equipment

The measuring equipment used to perform the tests documented in this report has been calibrated in accordance with the manufacturers' recommendations, and is traceable to recognized national standards.

Dielectric Property Measurements

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Network Analyzer	Agilent	E753ES	MY40000980	4/7/2015
Dielectric Probe kit	SPEAG	DAK-3.5	1082	9/16/2015
Dielectric Probe kit	SPEAG	DAK-3.5 Short	SM DAK 200 BA	N/A
Thermometer	Control Company	4242	122529163	10/8/2015
Thermometer	EXTECH	445703	CCS-200	3/24/2015

System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
HP Signal Generator	HP	8665B	3546A00784	6/23/2015
Power Meter	Agilent	N1911A	MY53060016	8/7/2015
Power Sensor	Agilent	E9323A	MY53070003	5/1/2015
Power Meter	HP	437B	3125U09516	10/6/2015
Power Sensor	HP	8481A	3318A95392	10/6/2015
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1622052	N/A
Bi-directional coupler	Werlatone, Inc.	C8060-102	2711	N/A
DC Power Supply	Sorensen Ametek	XT20-3	1318A00530	N/A
Synthesized Signal Generator	Agilent	8665B	3438A00633	8/29/2015
Power Meter	HP	437B	3125U11347	8/27/2015
Power Sensor	HP	8481A	1926A16917	10/10/2015
Power Meter	HP	437B	3125U16345	6/16/2015
Power Sensor	HP	8481A	2702A60780	6/16/2015
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1808938	N/A
Bi-directional coupler	Werlatone, Inc.	C8060-102	2710	N/A
DC Power Supply	HP	6296A	2841A-05955	N/A
E-Field Probe (SAR 1)	SPEAG	EX3DV4	3902	5/19/2015
E-Field Probe (SAR 5)	SPEAG	EX3DV4	3991	5/16/2015
Data Acquisition Electronics (SAR 1)	SPEAG	DAE3	427	1/21/2015
Data Acquisition Electronics (SAR 5)	SPEAG	DAE4	1439	5/14/2015
System Validation Dipole	SPEAG	D2450V2	748	2/18/2015
System Validation Dipole	SPEAG	D5GHzV2	1003	2/26/2015
Thermometer (SAR Lab 1)	EXTECH	445703	CCS-205	3/24/2015
Thermometer (SAR Lab 5)	EXTECH	445703	CCS-239	6/3/2015

Others

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Power Meter	Agilent	N1912A	MY53040015	7/10/2015
Power Sensor	Agilent	N1921A	MY52200012	9/26/2015

5. Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 10-g SAR within a frequency band is < 3.0 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Standard 1528-2013 is not required in SAR reports submitted for equipment approval.

6. Device Under Test (DUT) Information

6.1. DUT Description

Model: P2523	
Device Dimension	Overall (Length x Width): 107.5 mm x 138.6 mm Overall Diagonal: 157 mm Display Diagonal: 152.6 mm
Battery Back Cover	☐ Normal Battery Cover ☐ Normal Battery Cover with NFC ☐ Wireless Charger Battery Cover ☐ Wireless Charger Battery Cover with NFC ☒ The rechargeable battery is not user accessible.
Battery Options	☐ Standard – Lithium-ion battery, Rating N/A Vdc, N/A Wh ☐ Extended (large capacity) ☒ The rechargeable battery is not user accessible.

6.2. Wireless Technologies

Wireless technologies	Frequency bands	Operating mode	Duty Cycle used for SAR testing
Wi-Fi	2.4 GHz	802.11b 802.11g 802.11n (HT20) 802.11n (HT40)	100%
	5 GHz	802.11a 802.11n (HT20) 802.11n (HT40) 802.11ac (VHT40) 802.11ac (VHT80)	100%
Bluetooth	2.4 GHz	Version 4.0 LE	77.5% (DH5)

6.3. Nominal and Maximum Output Power

KDB 447498 sec.4.1.(3) at the maximum rated output power and within the tune-up tolerance range specified for the product, but not more than 2 dB lower than the maximum tune-up tolerance limit

Upper limit (dB): -1.5 ~ 0.5		Channel Number	Core 0		Core 1	
RF Air interface	Mode		Target	Max. tune-up tolerance limit	Target	Max. tune-up tolerance limit
WiFi 2.4 GHz	802.11b	1	19.0	**19.5**	19.0	**19.5**
		6	19.0	**19.5**	19.0	**19.5**
		10	19.0	**19.5**	19.0	**19.5**
		11	19.0	**19.5**	19.0	**19.5**
	802.11g	1	13.0	**13.5**	13.0	**13.5**
		2	16.5	**17.0**	16.5	**17.0**
		3	18.0	**18.5**	18.0	**18.5**
		6	18.0	**18.5**	18.0	**18.5**
		9	18.0	**18.5**	18.0	**18.5**
		10	17.0	**17.5**	17.0	**17.5**
		11	14.5	**15.0**	14.5	**15.0**
	802.11n HT20	1	14.5	**15.0**	14.5	**15.0**
		2	15.5	**16.0**	15.5	**16.0**
		3	17.5	**18.0**	17.5	**18.0**
		6	17.5	**18.0**	17.5	**18.0**
		10	17.5	**18.0**	17.5	**18.0**
		11	13.0	**13.5**	13.0	**13.5**
	802.11n HT40	3	12.0	**12.5**	12.0	**12.5**
		6	13.5	**14.0**	13.5	**14.0**
		9	13.0	**13.5**	13.0	**13.5**
WiFi 5 GHz	802.11a	36	15.0	**15.5**	15.0	**15.5**
		40	15.0	**15.5**	15.0	**15.5**
		44	15.0	**15.5**	15.0	**15.5**
		48	15.0	**15.5**	15.0	**15.5**
		149	15.0	**15.5**	15.0	**15.5**
		153	15.0	**15.5**	15.0	**15.5**
		157	15.0	**15.5**	15.0	**15.5**
		161	15.0	**15.5**	15.0	**15.5**
		165	15.0	**15.5**	15.0	**15.5**
	802.11n HT20	36	12.0	**12.5**	12.0	**12.5**
		40	12.0	**12.5**	12.0	**12.5**
		48	12.0	**12.5**	12.0	**12.5**
		149	11.0	**11.5**	11.0	**11.5**
		157	13.0	**13.5**	13.0	**13.5**
		165	13.0	**13.5**	13.0	**13.5**
	802.11n HT40	38	12.0	**12.5**	12.0	**12.5**
		46	12.0	**12.5**	12.0	**12.5**
		151	11.0	**11.5**	11.0	**11.5**
		159	15.0	**15.5**	15.0	**15.5**
	802.11ac VHT40	38	12.0	**12.5**	12.0	**12.5**
		46	12.0	**12.5**	12.0	**12.5**
		151	11.0	**11.5**	11.0	**11.5**
		159	15.0	**15.5**	15.0	**15.5**
	802.11ac VHT80	42	12.0	**12.5**	12.0	**12.5**
		155	12.5	**13.0**	12.5	**13.0**
Bluetooth		N/A	10.0	**10.5**		
Bluetooth LE		N/A	6.5	**7.0**		

7. RF Exposure Conditions (Test Configurations)

The RF exposure test configurations were determined through a KDB enquiry.

Refer to “SAR Photos and Ant locations” Appendix for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

Wireless technologies	RF Exposure Conditions	DUT-to-User Separation	Test Position	Antenna-to-edge/surface	SAR Required
WLAN	Extremity (Hand/Wrist/Ankle)	0	Rear	N/A	Yes

8. Dielectric Property Measurements & System Check

8.1. Dielectric Property Measurements

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within ± 2°C of the temperature when the tissue parameters are characterized.

The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use; or earlier if the dielectric parameters can become out of tolerance; for example, when the parameters are marginal at the beginning of the measurement series.

Tissue dielectric parameters were measured at the low, middle and high frequency of each operating frequency range of the test device.

Tissue Dielectric Parameters

FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

Target Frequency (MHz)	Head		Body	
	ε_r	σ (S/m)	ε_r	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5000	36.2	4.45	49.3	5.07
5100	36.1	4.55	49.1	5.18
5200	36.0	4.66	49.0	5.30
5300	35.9	4.76	48.9	5.42
5400	35.8	4.86	48.7	5.53
5500	35.6	4.96	48.6	5.65
5600	35.5	5.07	48.5	5.77
5700	35.4	5.17	48.3	5.88
5800	35.3	5.27	48.2	6.00

IEEE Standard 1528-2013

Refer to Table 3 within the IEEE Standard 1528-2013

Dielectric Property Measurements Results:

SAR Lab 1

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
12/4/2014	Body 2450	e'	50.3700	Relative Permittivity (ϵ_r):	50.37	52.70	-4.42	5
		e"	14.9500	Conductivity (σ):	2.04	1.95	4.44	5
	Body 2410	e'	50.5300	Relative Permittivity (ϵ_r):	50.53	52.76	-4.23	5
		e"	14.8800	Conductivity (σ):	1.99	1.91	4.53	5
	Body 2475	e'	50.2500	Relative Permittivity (ϵ_r):	50.25	52.67	-4.59	5
		e"	15.0800	Conductivity (σ):	2.08	1.99	4.54	5
12/8/2014	Body 2450	e'	50.9100	Relative Permittivity (ϵ_r):	50.91	52.70	-3.40	5
		e"	14.7500	Conductivity (σ):	2.01	1.95	3.04	5
	Body 2410	e'	51.0500	Relative Permittivity (ϵ_r):	51.05	52.76	-3.24	5
		e"	14.6000	Conductivity (σ):	1.96	1.91	2.57	5
	Body 2475	e'	50.8100	Relative Permittivity (ϵ_r):	50.81	52.67	-3.53	5
		e"	14.8100	Conductivity (σ):	2.04	1.99	2.67	5

SAR Lab 5

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
12/4/2014	Body 5180	e'	47.2500	Relative Permittivity (ϵ_r):	47.25	49.05	-3.66	5
		e"	18.9500	Conductivity (σ):	5.46	5.27	3.54	5
	Body 5200	e'	47.1300	Relative Permittivity (ϵ_r):	47.13	49.02	-3.85	5
		e"	18.7900	Conductivity (σ):	5.43	5.29	2.61	5
	Body 5600	e'	46.4800	Relative Permittivity (ϵ_r):	46.48	48.48	-4.12	5
		e"	19.1600	Conductivity (σ):	5.97	5.76	3.56	5
	Body 5800	e'	46.0700	Relative Permittivity (ϵ_r):	46.07	48.20	-4.42	5
		e"	19.3700	Conductivity (σ):	6.25	6.00	4.11	5
	Body 5825	e'	46.1300	Relative Permittivity (ϵ_r):	46.13	48.20	-4.29	5
		e"	19.4000	Conductivity (σ):	6.28	6.00	4.72	5
12/8/2014	Body 5180	e'	47.0500	Relative Permittivity (ϵ_r):	47.05	49.05	-4.07	5
		e"	18.7900	Conductivity (σ):	5.41	5.27	2.67	5
	Body 5200	e'	46.9500	Relative Permittivity (ϵ_r):	46.95	49.02	-4.22	5
		e"	18.8300	Conductivity (σ):	5.44	5.29	2.83	5
	Body 5600	e'	46.2800	Relative Permittivity (ϵ_r):	46.28	48.48	-4.53	5
		e"	19.2300	Conductivity (σ):	5.99	5.76	3.94	5
	Body 5800	e'	45.8300	Relative Permittivity (ϵ_r):	45.83	48.20	-4.92	5
		e"	19.5000	Conductivity (σ):	6.29	6.00	4.81	5
	Body 5825	e'	45.9400	Relative Permittivity (ϵ_r):	45.94	48.20	-4.69	5
		e"	19.4300	Conductivity (σ):	6.29	6.00	4.89	5

8.2. System Check

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device. The same SAR probe(s) and tissue-equivalent media combinations used with each specific SAR system for system verification must be used for device testing. When multiple probe calibration points are required to cover substantially large transmission bands, independent system verifications are required for each probe calibration point. A system verification must be performed before each series of SAR measurements using the same probe calibration point and tissue-equivalent medium. Additional system verification should be considered according to the conditions of the tissue-equivalent medium and measured tissue dielectric parameters, typically every three to four days when the liquid parameters are re-measured or sooner when marginal liquid parameters are used at the beginning of a series of measurements.

System Performance Check Measurement Conditions:

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness: 2.0 ±0.2 mm (bottom plate) filled with Body or Head simulating liquid of the following parameters.
- The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm for SAR measurements ≤ 3 GHz and ≥ 10.0 cm for measurements > 3 GHz.
- The DASY system with an E-Field Probe was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10 mm (above 1 GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 15 mm was aligned with the dipole.
  For 5 GHz band - The coarse grid with a grid spacing of 10 mm was aligned with the dipole.
- Special 7x7x7 (below 3 GHz) and/or 8x8x7 (above 3 GHz) fine cube was chosen for the cube.
- Distance between probe sensors and phantom surface was set to 3 mm.
  For 5 GHz band - Distance between probe sensors and phantom surface was set to 2.5 mm
- The dipole input power (forward power) was 100 mW.
- The results are normalized to 1 W input power.

Reference Target SAR Values

The reference SAR values can be obtained from the calibration certificate of system validation dipoles

System Dipole	Serial No.	Cal. Date	Freq. (MHz)	Target SAR Values (W/kg)		
				1g/10g	Head	Body
D2450V2	748	2/18/2014	2450	1g	51.6	50.7
				10g	24.0	23.7
D5GHzV2	1003	2/26/2014	5200	1g	77.7	73.5
				10g	22.2	20.5
			5600	1g	81.8	79.6
				10g	23.2	22.1
			5800	1g	78.3	73.8
				10g	22.1	20.4

System Check Results

The 1-g and 10-g SAR measured with a reference dipole, using the required tissue-equivalent medium at the test frequency, must be within 10% of the manufacturer calibrated dipole SAR target.

SAR Lab 1

Date Tested	System Dipole		T.S. Liquid		Measured Results		Target (Ref. Value)	Delta ±10 %	Plot No.
	Type	Serial #			Zoom Scan to 100 mW	Normalize to 1 W			
12/4/2014	D2450V2	748	Body	1g	5.31	53.1	50.70	4.73	
				10g	2.46	24.6	23.7	3.80	
12/8/2014	D2450V2	748	Body	1g	5.40	54.0	50.70	6.51	1,2
				10g	2.49	24.9	23.7	5.06	

SAR Lab 5

Date Tested	System Dipole		T.S. Liquid		Measured Results		Target (Ref. Value)	Delta ±10 %	Plot No.
	Type	Serial #			Zoom Scan to 100 mW	Normalize to 1 W			
12/4/2014	5200	1003	Body	1g	7.63	76.3	73.50	3.81	
				10g	2.15	21.5	20.50	4.88	
12/4/2014	5600	1003	Body	1g	8.31	83.1	79.60	4.40	
				10g	2.31	23.1	22.10	4.52	
12/4/2014	5800	1003	Body	1g	7.90	79.0	73.80	7.05	
				10g	2.17	21.7	20.40	6.37	
12/8/2014	5200	1003	Body	1g	7.80	78.0	73.50	6.12	
				10g	2.20	22.0	20.50	7.32	
12/8/2014	5600	1003	Body	1g	8.50	85.0	79.60	6.78	
				10g	2.37	23.7	22.10	7.24	
12/8/2014	5800	1003	Body	1g	7.88	78.8	73.80	6.78	3,4
				10g	2.21	22.1	20.40	8.33	

9. Conducted Output Power Measurements

9.1. Wi-Fi DTS (2.4 GHz) Band

Required Test Channels per KDB 248227 D01

Measured Results

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Avg Pwr (dBm)		SAR Test (Yes/No)
					Core 0	Core 1	
2.4 (DTS)	802.11b	1 Mbps	1	2412	18.5	17.6	Yes
			6	2437	18.4	18.5	
			11	2462	18.2	18.3	
	802.11g	6 Mbps	1	2412	12.7	12.6	No
			2	2417	16.1	16.2	
			3	2422	18.1	18.3	
			4	2427	18.0	17.9	
			6	2437	18.2	18.2	
			8	2447	18.1	18.2	
			9	2452	17.7	18.1	
			10	2457	16.6	17.0	
			11	2462	12.2	12.6	
	802.11n (HT20)	MCS0	1	2412	14.6	14.1	No
			2	2417	15.5	15.5	
			3	2422	17.7	17.3	
			6	2437	17.3	17.3	
			9	2452	17.4	17.8	
			10	2457	16.9	17.5	
			11	2462	13.0	13.0	
	802.11n (HT40)	MCS0	3	2422	12.0	12.0	No
			6	2437	13.4	13.4	
			9	2452	13.0	13.0	

Power measurements to determine worst-case data rates

Mode	Ch #	Freq. (MHz)	Data Rate	Avg Pwr (dBm)		SAR test (Yes/No)
				Core 0	Core 1	
802.11b	6	2437	1 Mbps	18.4	18.5	Yes
			2 Mbps	18.4	18.2	No
			5.5 Mbps	18.4	18.3	No
			11 Mbps	18.4	18.5	No

Note(s):

1. Per KDB 248227 D01,
    - Testing at higher data rates and higher order modulations is not required when the maximum average output power for each of these configurations is < ¼ dB higher than those measured at the lowest data rate.
    - Each channel should be tested at the lowest data rate in each a-b/g mode channel BW configuration.

9.2. Wi-Fi U-NII (5 GHz) Bands

Required Test Channels per KDB 248227 D01

Measured Results

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Avg Pwr (dBm)		SAR Test (Yes/No)
					Core 0	Core 1	
5.2 (UNII-1)	802.11a	6 Mbps	36	5180	14.5	14.8	Yes
			40	5200	14.2	14.9	
			44	5220	14.4	14.6	
			48	5240	14.1	14.5	
	802.11n (HT20)	MCS0	36	5180	10.8	10.8	No
			40	5200	10.8	12.4	
			48	5240	10.8	12.5	
	802.11n (HT40)	MCS0	38	5190	11.4	12.5	No
			46	5230	11.4	12.3	
	802.11ac (VHT40)	MCS0	38	5190	11.4	12.5	No
			46	5230	11.4	12.3	
	802.11ac (VHT80)	MCS0	42	5210	11.2	11.0	No
5.8 (UNII-3)	802.11a	6 Mbps	149	5745	14.8	13.0	Yes
			153	5765	14.7	13.0	
			157	5785	14.7	13.0	
			161	5805	14.6	13.0	
			165	5825	14.6	13.0	
	802.11n (HT20)	MCS0	149	5745	10.5	9.6	No
			157	5785	13.0	12.0	
			161	5805	13.0	12.0	
	802.11n (HT40)	MCS0	151	5755	10.8	9.6	No
			159	5795	14.9	13.7	
	802.11ac (VHT40)	MCS0	151	5755	10.8	9.6	No
			159	5795	14.9	13.7	
	802.11ac (VHT80)	MCS0	155	5775	12.3	11.3	No

Power measurements to determine worst-case data rates

Band	Ch #	Freq. (MHz)	Data Rate	Avg Pwr (dBm)	SAR test (Yes/No)
				Core 0	
5.2 GHz (UNII-1)	36	5180	6 Mbps	14.5	Yes
			9 Mbps	14.4	No
			12 Mbps	14.3	No
			18 Mbps	14.1	No
			24 Mbps	13.9	No
			36 Mbps	13.4	No
			48 Mbps	13.2	No
			54 Mbps	13.1	No
5.8 GHz (UNII-3)	149	5745	6 Mbps	14.8	Yes
			9 Mbps	14.1	No
			12 Mbps	14.0	No
			18 Mbps	13.8	No
			24 Mbps	13.5	No
			36 Mbps	13.1	No
			48 Mbps	12.9	No
			54 Mbps	12.7	No

Power measurements to determine worst-case data rates(continued)

Band	Ch #	Freq. (MHz)	Data Rate	Avg Pwr (dBm)	SAR test (Yes/No)
				Core 1	
5.2 GHz (UNII-1)	40	5200	6 Mbps	14.9	Yes
			9 Mbps	14.3	No
			12 Mbps	14.2	No
			18 Mbps	13.8	No
			24 Mbps	13.6	No
			36 Mbps	13.1	No
			48 Mbps	13.0	No
			54 Mbps	12.8	No
5.8 GHz (UNII-3)	165	5825	6 Mbps	13.0	Yes
			9 Mbps	13.0	No
			12 Mbps	13.0	No
			18 Mbps	12.7	No
			24 Mbps	12.5	No
			36 Mbps	12.1	No
			48 Mbps	13.9	No
			54 Mbps	13.7	No

Note(s):

1. Per KDB 248227 D01,
    - Testing at higher data rates and higher order modulations is not required when the maximum average output power for each of these configurations is < ¼ dB higher than those measured at the lowest data rate.
    - Each channel should be tested at the lowest data rate in each a-b/g mode channel BW configuration.

9.3. Bluetooth

Maximum tune-up tolerance limit is 10.5 dBm from the rated nominal maximum output power. This power level qualifies for exclusion of SAR testing.

Refer to Standalone SAR Test Exclusion Considerations Section.

10. Measured and Reported (Scaled) SAR Results

SAR Test Reduction criteria are as follows:

KDB 447498 D01 General RF Exposure Guidance:
Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:

- ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
- ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
- ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz

KDB 248227 D01 SAR Measurements Procedures for 802.11 a/b/g Transmitters v01r02 (pg.6):
Each channel should be tested at the lowest data rate in each a-b/g mode or 4.9 GHz channel BW configuration.
When the extrapolated maximum peak SAR for the maximum output channel is ≤ 1.6 W/kg and the 1-g averaged SAR is ≤ 0.8 W/kg, testing of other channels in the “default test channels” or “required test channels” configuration is optional.

April 2013 TCB Workshop Updates:
Apply usual 802.11 test exclusion considerations, but include 802.11ac SAR for highest 802.11a configuration in each frequency band and each exposure condition.

10.1. Wi-Fi (DTS Band)

2.4 GHz Bands							Core 0				Core 1				Plot No.
							Power (dBm)		10-g SAR (W/kg)		Power (dBm)		10-g SAR (W/kg)		
RF Exposure Condition	Active Antenna(s)	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Tune-up limit	Meas.	Meas.	Scaled	Tune-up limit	Meas.	Meas.	Scaled	
Extremity	2.4 GHz (DTS)	802.11b	0	Rear	1	2412	19.5	18.5	0.037	0.047					
					6	2437	19.5	18.4	0.055	0.071	19.5	18.5	0.037	0.047	
					11	2462	19.5	18.2	0.070	0.094					1

10.2. Wi-Fi (U-NII Band)

5.2 GHz (U-NII-1)						Core 0				Core 1				Plot No.
						Power (dBm)		10-g SAR (W/kg)		Power (dBm)		10-g SAR (W/kg)		
RF Exposure Condition	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Tune-up limit	Meas.	Meas.	Scaled	Tune-up limit	Meas.	Meas.	Scaled	
Extremity	802.11a 6 Mbps	0	Rear	36	5180	15.5	14.5	0.042	0.053	15.5	14.8	0.130	0.153	
	802.11ac (VHT80)	0	Rear	42	5210					12.5	11.0	0.177	0.250	2

5.8 GHz (U-NII-3)						Core 0				Core 1				Plot No.
						Power (dBm)		10-g SAR (W/kg)		Power (dBm)		10-g SAR (W/kg)		
RF Exposure Condition	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Tune-up limit	Meas.	Meas.	Scaled	Tune-up limit	Meas.	Meas.	Scaled	
Extremity	802.11a	0	Rear	157	5785	15.5	14.7	0.025	0.030	15.5	13.0	0.082	0.146	
	802.11ac (VHT80)	0	Rear	155	5775					13.0	11.3	0.140	0.207	3

10.3. Bluetooth

Standalone SAR Test Exclusion Considerations & Estimated SAR

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)]·[√f(GHz)] ≤ 3.0, for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

- $f_{(GHz)}$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

When the standalone SAR test exclusion is applied to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:

- *(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)]·[√$f_{(GHz)}$/x]* W/kg for test separation distances ≤ 50 mm;
  where x = 7.5 for 1-g SAR, and x = 18.75 for 10-g SAR.
- 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the test separation distances is > 50 mm.

Extremity

Max. tune-up tolerance limit		Min. test separation distance (mm)	Frequency (GHz)	SAR test exclusion Result*	Test Configuration	Estimated 10-g SAR (W/kg)
(dBm)	(mW)					
10.5	11	5	2.480	3.5	Rear	0.188

Conclusion:

*: The computed value is < 7.5; therefore, Bluetooth qualifies for Standalone SAR test exclusion.

11. SAR Measurement Variability

In accordance with published RF Exposure KDB 865664 D01 SAR measurement 100 MHz to 6 GHz. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

1) Repeated measurement is not required when the original highest measured SAR is < 2 W/kg; steps 2) through 4) do not apply.
2) When the original highest measured SAR is ≥ 2 W/kg, repeat that measurement once.
3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 3.625 W/kg (~ 10% from the 10-g SAR limit).
4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥ 3.75 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

Frequency Band (MHz)	Air Interface	RF Exposure Conditions	Test Position	Repeated SAR (Yes/No)	Highest Measured SAR (W/kg)	Repeated Measured SAR (W/kg)	Largest to Smallest SAR Ratio
2400	Wi-Fi 802.11b/g/n	Extremity	Rear	No	0.07	N/A	N/A
5200	Wi-Fi 802.11a/n/ac	Extremity	Rear	No	0.177	N/A	N/A
5800	Wi-Fi 802.11a/n/ac	Extremity	Rear	No	0.140	N/A	N/A

Conclusion:

Repeated Measurement is not required since there are no SAR measurements > 2 W/kg.

12. Simultaneous Transmission SAR Analysis

Simultaneous Transmission Condition

RF Exposure Condition	Item	Capable Transmit Configurations		
		Core 0		Core 1
Extremity	1	Wi-Fi 2.4 GHz	+	Wi-Fi 2.4 GHz
	2	Wi-Fi 5 GHz	+	Wi-Fi 5 GHz
	3	Wi-Fi 5 GHz / BT	+	Wi-Fi 5 GHz
	4	Bluetooth	+	Wi-Fi 2.4 GHz
	5	Bluetooth	+	Wi-Fi 5 GHz
Notes: 1. Wi-Fi 2.4 GHz Radio cannot transmit simultaneously with Bluetooth Radio when on the same antenna.				

12.1. Sum of the SAR Wi-Fi & BT

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario					∑ 10-g SAR (mW/g)	SPLSR (Yes/ No)
			Wi-Fi(DTS)		Wi-Fi(UNII)		Bluetooth		
			① Core 0	② Core 1	③ Core 0	④ Core 1	⑤ Core 0		
Extremity	Rear	① + ②	0.094	0.047				**0.141**	No
		③ + ④			0.053	0.250		**0.303**	No
		③ + ④ + ⑤			0.053	0.250	0.188	0.491	No
		② + ⑤		0.047			0.188	0.235	No
		③ + ⑤			0.053		0.188	0.241	No

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because the either sum of the 10-g SAR is < 4 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

Appendixes

Refer to separated files for the following appendixes.

A_14U19497-S1v0 SAR Photos & Ant. Locations

B_14U19497-S1v0 SAR Highest SAR Test Plots

C_14U19497-S1v0 SAR System Check Plots

D_14U19497-S1v0 SAR Tissue Ingredients

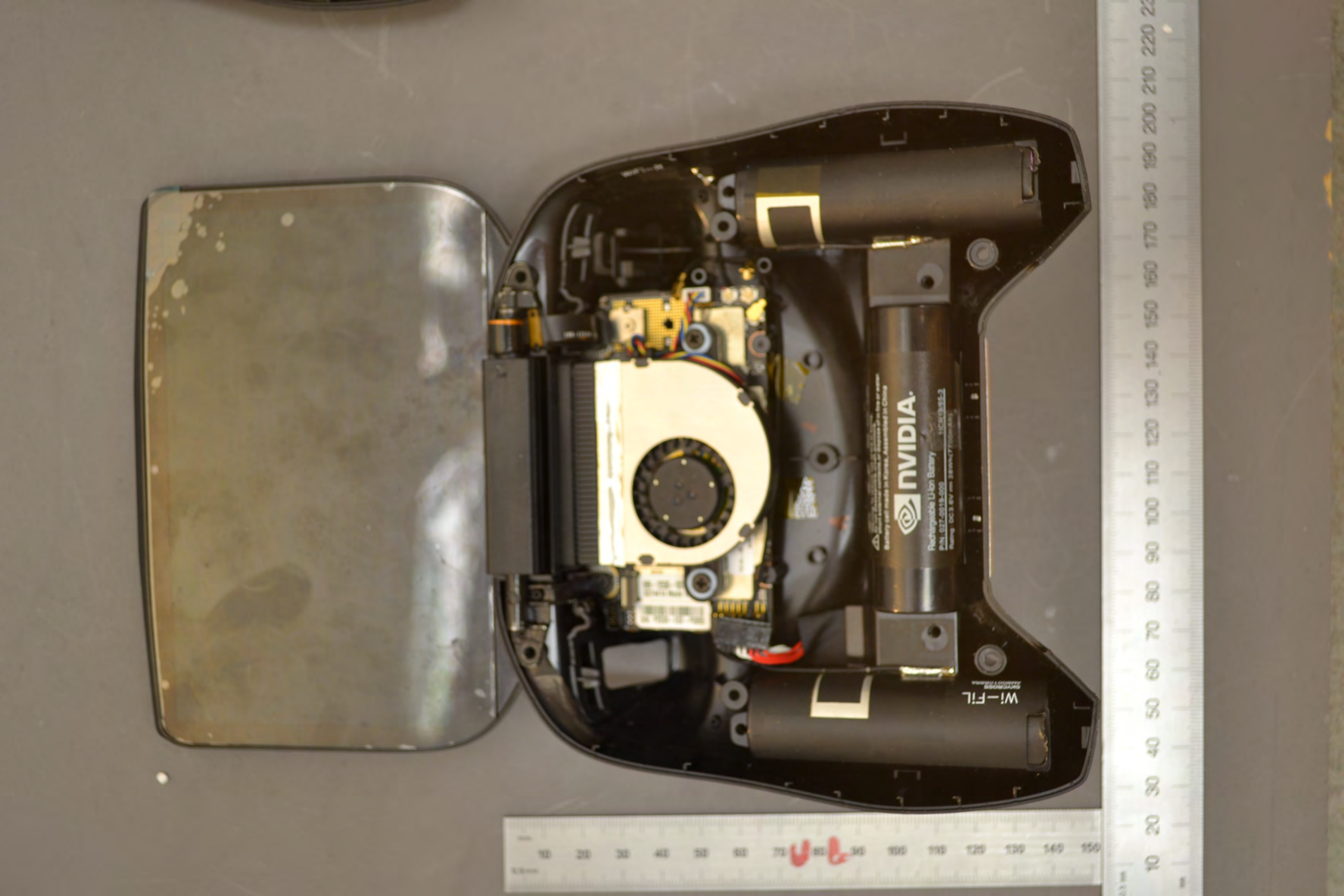
E_14U19497-S1v0 SAR Probe Cal. Certificates

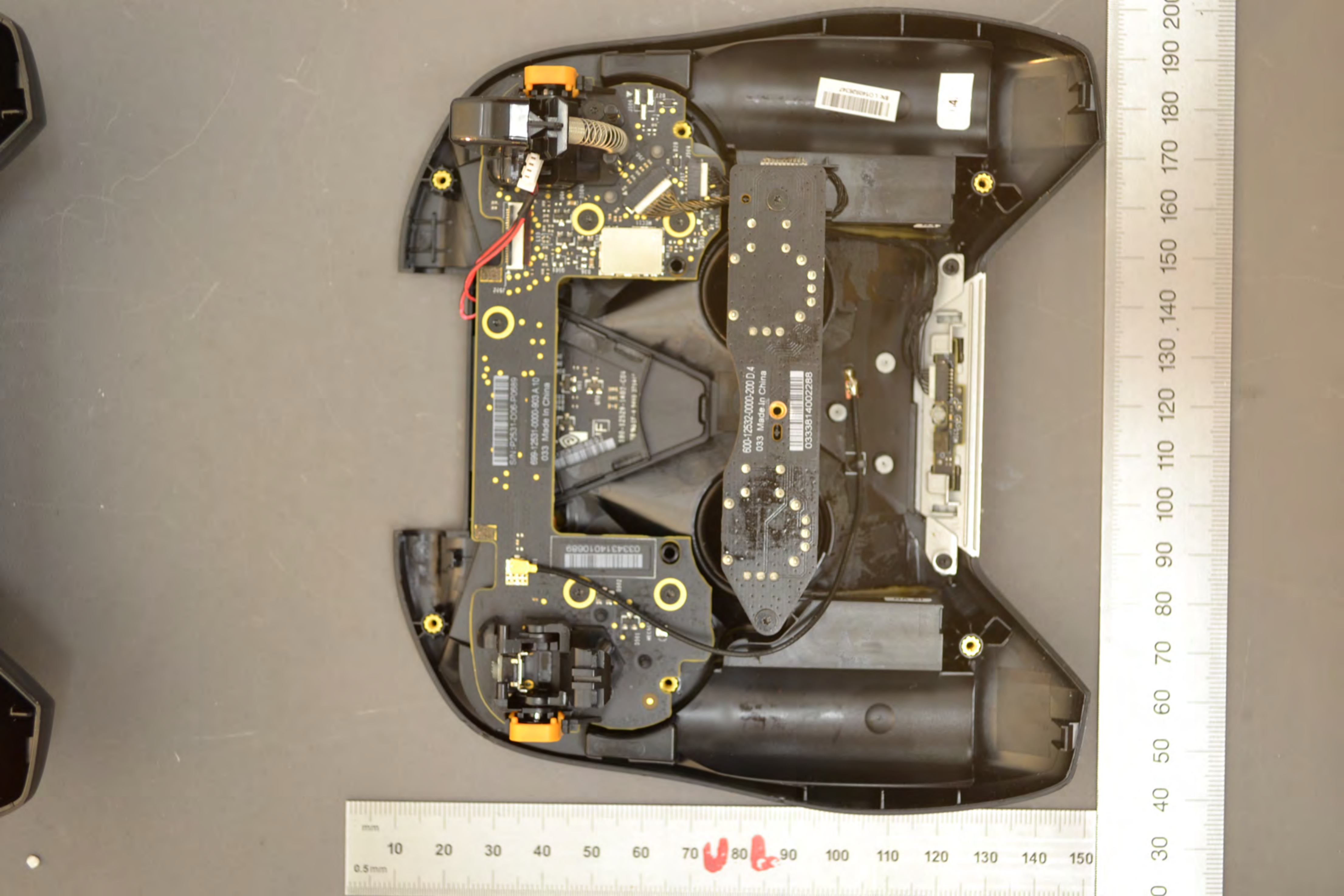
F_14U19497-S1v0 SAR Dipole Cal. Certificates

END OF REPORT

14U19497
033 Made in China
699-12531-0000-903 A 10
S/N:P2531-D06-P0348
03343140000348
0.5mm
mm
UL

14U19497
HF
RoHS COMPLIANT
180-12531-DABA-D06
S2 PU
PL S1
PR S4
PD S3
HALL
94V0EF-44214(01)
PCB MADE IN HONG KONG
10
Y
X
B
A
UL


NVIDIA
Rechargeable Li-Ion Battery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699-12531-0000-903 A.10
033 Made in China
600-12532-0000-200 D.4
033 Made in China
0333814002288
mm
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0.5mm
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160
170
180
190
200

Test Laboratory: UL Verification Services Inc., SAR Lab 1　　Date/Time: 12/8/2014 9:14:51 AM

20141208_SystemPerformanceCheck-D2450V2 SN 748

Frequency: 2450 MHz; Duty Cycle: 1:1;　　Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used: f = 2450 MHz; σ = 2.01 S/m; ε_r = 50.914; ρ = 1000 kg/m^3
DASY5 Configuration:

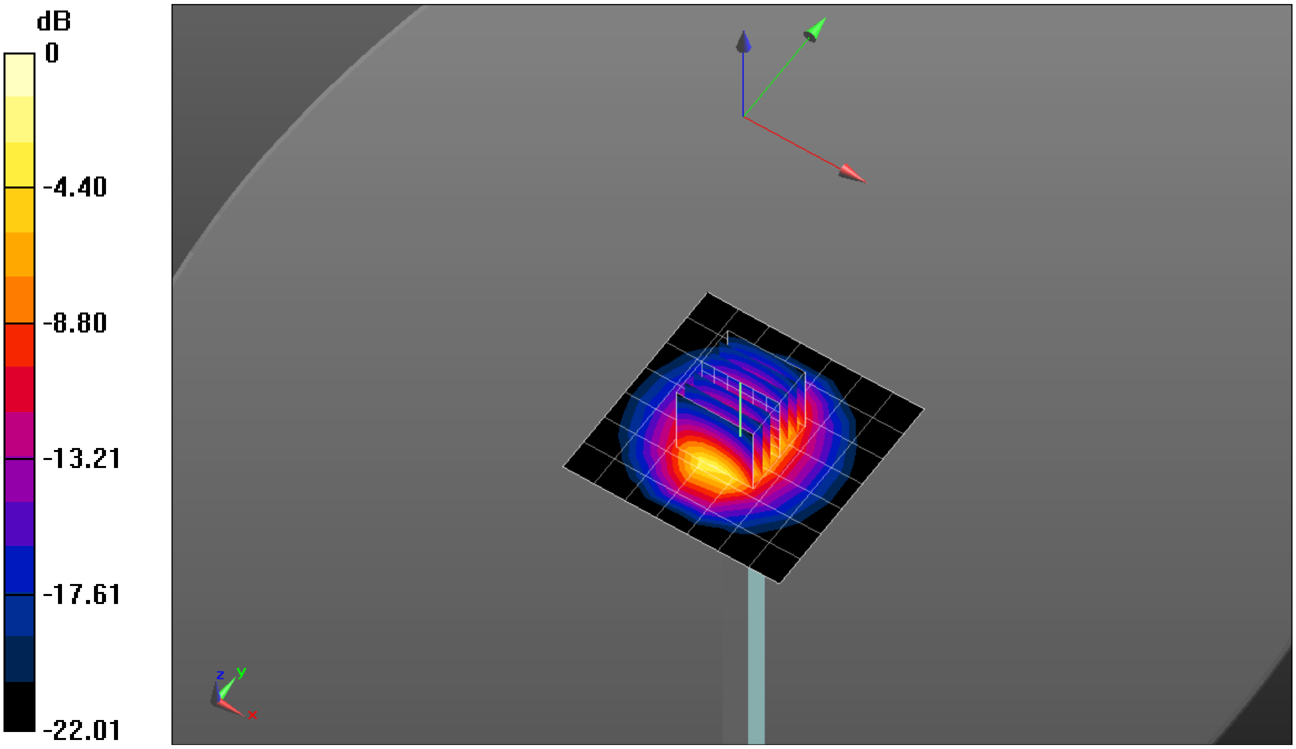
- Area Scan Setting: Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE3 Sn427; Calibrated: 1/21/2014
- Probe: EX3DV4 - SN3902; ConvF(7.35, 7.35, 7.35); Calibrated: 5/19/2014;
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: ELI-B v5.0; Type: QDOVA002AA; Serial: TP:1195

Body/Pin=100 mW/Area Scan (8x8x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 5.91 W/kg

Body/Pin=100 mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 61.661 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 11.2 W/kg
SAR(1 g) = 5.4 W/kg; SAR(10 g) = 2.49 W/kg
Maximum value of SAR (measured) = 7.70 W/kg

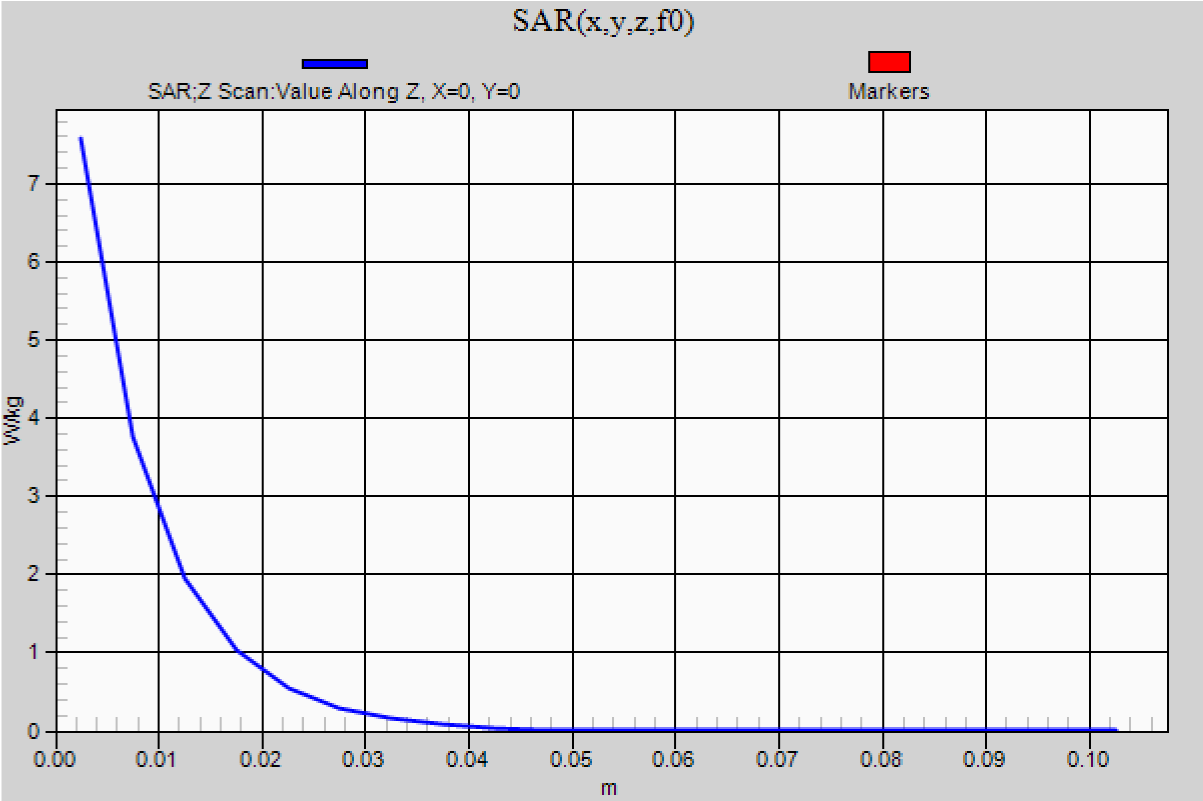


0 dB = 7.70 W/kg = 8.86 dBW/kg

20141208_SystemPerformanceCheck-D2450V2 SN 748

Frequency: 2450 MHz; Duty Cycle: 1:1

Body/Pin=100 mW/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 7.58 W/kg



20141208_SystemPerformanceCheck-D5GHzV2 SN 1003

Frequency: 5800 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used: f = 5800 MHz; σ = 6.293 S/m; ε_r = 45.83; ρ = 1000 kg/m^3
DASY5 Configuration:

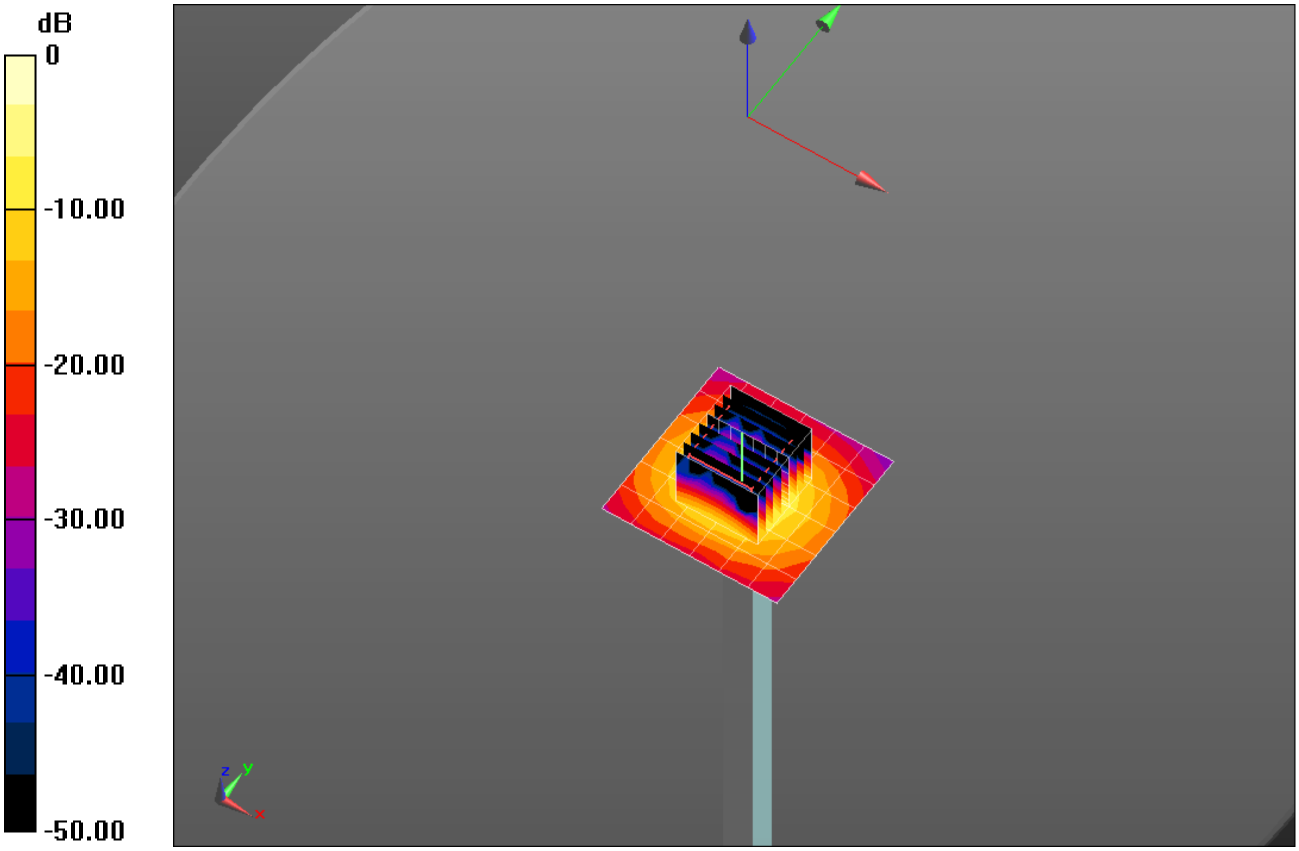
- Area Scan Setting: Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn1439; Calibrated: 5/14/2014
- Probe: EX3DV4 - SN3991; ConvF(4.32, 4.32, 4.32); Calibrated: 5/16/2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Phantom: ELI v5.0 (B); Type: QDOVA002AA; Serial: TP:1257

Body/5.8 GHz, Pin=100mW/Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 19.9 W/kg

Body/5.8 GHz, Pin=100mW/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 48.79 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 36.9 W/kg
SAR(1 g) = 7.88 W/kg; SAR(10 g) = 2.21 W/kg
Maximum value of SAR (measured) = 19.6 W/kg

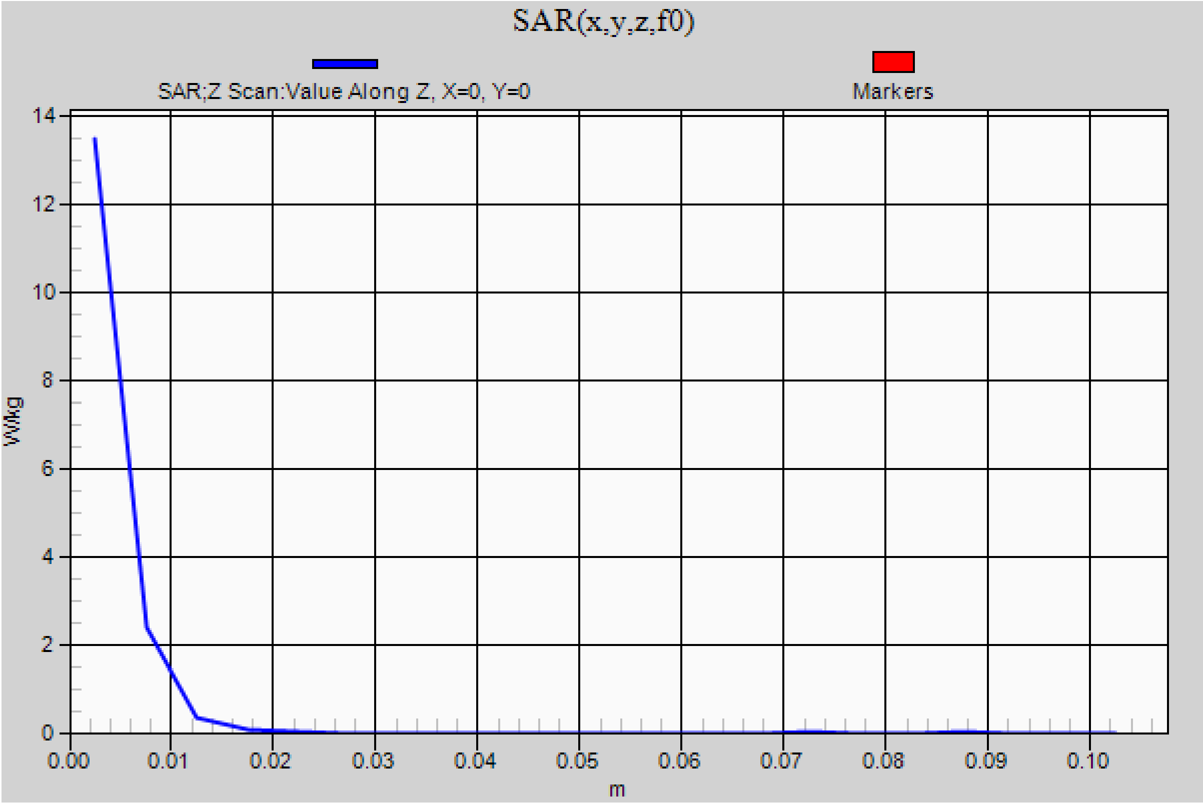


0 dB = 19.6 W/kg = 12.92 dBW/kg

20141208_SystemPerformanceCheck-D5GHzV2 SN 1003

Frequency: 5800 MHz; Duty Cycle: 1:1

Body/5.8 GHz, Pin=100mW/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 13.5 W/kg



Head Tissue Simulating Liquids

Head Tissue	Parameters according to IEEE Std 1528-2013 / IEC 62209 / FCC KDB 865664 D01		
Narrow-Band Solutions (±5% tolerance)	**Product**	**Test Frequency (MHz)**	**Main Ingredients**
	HSL300V2	300	Water, Sugar
	HSL450V2	450	Water, Sugar
	HSL750V2	750	Water, Sugar
	HSL900V2	835, 900	Water, Sugar
	HSL1450V2	1450, 1500, 1640	Water, DGBE
	HSL1750V2	1750	Water, DGBE
	HSL1800V2	1800, 1900	Water, DGBE
	HSL1900V2	1900	Water, DGBE
	HSL1950V2	1950, 2000	Water, DGBE
	HSL2450V2	2450, 2600	Water, DGBE
Broad-Band Solutions (±5% tolerance)	**Product**	**Test Frequency (MHz)**	**Main Ingredients**
	HBBL30-250V3	30-250	Water, Tween
	HBBL1350-1850V3	1400-1800	Water, Tween
	HBBL1550-1950V3	1750-1900	Water, Tween
	HBBL1900-3800V3	1950-3000	Water, Tween
	HBBL3500-5800V5	3500-5800	Water, Oil

Body Tissue Simulating Liquids

Body Tissue (Muscle)	Parameters according to FCC KDB 865664 D01		
Narrow-Band Solutions (±5% tolerance)	**Product**	**Test Frequency (MHz)**	**Main Ingredients**
	MSL300V2	300	Water, Sugar
	MSL450V2	400, 450	Water, Sugar
	MSL750V2	750	Water, Sugar
	MSL900V2	835, 900	Water, Sugar
	MSL1450V2	1450, 1500, 1640	Water, DGBE
	MSL1750V2	1750	Water, DGBE
	MSL1800V2	1800, 1900	Water, DGBE
	MSL1900V2	1900	Water, DGBE
	MSL1950V2	1950, 2100	Water, DGBE
	MSL2450V2	2450, 2600	Water, DGBE
Broad-Band Solutions (±5% tolerance)	**Product**	**Test Frequency (MHz)**	**Main Ingredients**
	MBBL130-250V3	130-250	Water, Tween
	MBBL1350-1850V3	1350-1800	Water, Tween
	MBBL1550-1950V3	1550-1850	Water, Tween
	MBBL1900-3800V3	1950-3800	Water, Tween
	MBBL3500-5800V5	3500-5800	Water, Oil

Schmid & Partner Engineering AG
s p e a g

Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
info@speag.com, http://www.speag.com

Measurement Certificate / Material Test

Item Name	**Head Tissue Simulating Liquid (HSL750V2)**
Product No.	SL AAH 075 AA (Charge: 140210-5)
Manufacturer	SPEAG

Measurement Method

TSL dielectric parameters measured using calibrated OCP probe.

Setup Validation

Validation results were within ± 2.5% towards the target values of Methanol.

Target Parameters

Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

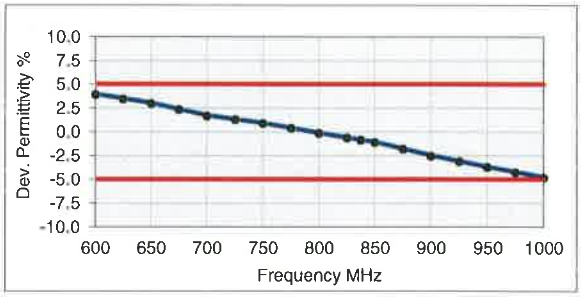
Test Condition

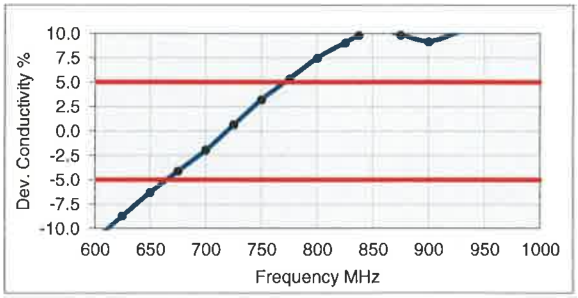
Ambient	Environment temperatur (22 ± 3)°C and humidity < 70%.
TSL Temperature	22°C
Test Date	12-Feb-14
Operator	IEN

Additional Information

TSL Density	1.284 g/cm^3
TSL Heat-capacity	2.701 kJ/(kg*K)

	Measured			Target		Diff.to Target [%]	
f [MHz]	**HP-e'**	**HP-e"**	**sigma**	eps	sigma	**Δ-eps**	**Δ-sigma**
600	44.4	23.49	0.78	42.7	0.88	3.9	-11.1
625	44.1	23.23	0.81	42.6	0.88	3.5	-8.6
650	43.7	22.96	0.83	42.5	0.89	3.0	-6.2
675	43.3	22.68	0.85	42.3	0.89	2.4	-4.1
700	42.9	22.40	0.87	42.2	0.89	1.7	-1.9
725	42.6	22.25	0.90	42.1	0.89	1.3	0.7
750	**42.3**	**22.10**	**0.92**	**41.9**	**0.89**	**0.9**	**3.2**
775	42.0	21.89	0.94	41.8	0.90	0.4	5.4
800	41.6	21.67	0.96	41.7	0.90	-0.1	7.5
825	41.3	21.55	0.99	41.6	0.91	-0.6	9.0
838	41.2	21.49	1.00	41.5	0.91	-0.8	9.8
850	41.1	21.42	1.01	41.5	0.92	-1.1	10.6
875	40.8	21.29	1.04	41.5	0.94	-1.8	9.9
900	40.5	21.15	1.06	41.5	0.97	-2.5	9.2
925	40.2	21.01	1.08	41.5	0.98	-3.1	10.0
950	39.9	20.87	1.10	41.4	0.99	-3.7	10.9
975	39.6	20.79	1.13	41.4	1.00	-4.3	12.2
1000	39.4	20.71	1.15	41.3	1.01	-4.8	13.5





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Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
info@speag.com, http://www.speag.com

Measurement Certificate / Material Test

Item Name	**Head Tissue Simulating Liquid (HSL900V2)**
Product No.	SL AAH 090 BB (Charge: 140205-4)
Manufacturer	SPEAG

Measurement Method

TSL dielectric parameters measured using calibrated OCP probe.

Setup Validation

Validation results were within ± 2.5% towards the target values of Methanol.

Target Parameters

Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

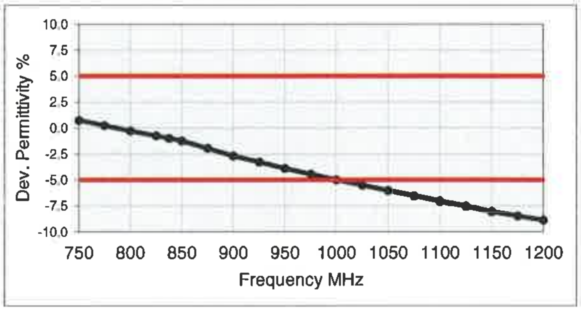
Test Condition

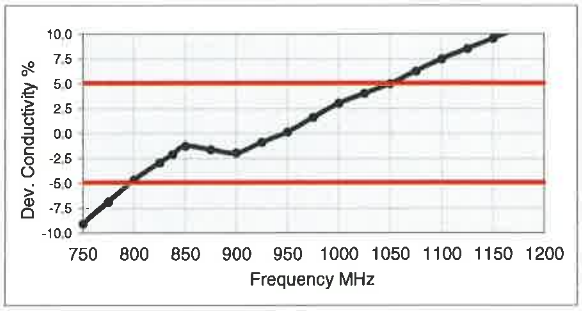
Ambient	Environment temperatur (22 ± 3)°C and humidity < 70%.
TSL Temperature	22°C
Test Date	12-Feb-14
Operator	IEN

Additional Information

TSL Density	1.280 g/cm^3
TSL Heat-capacity	2.942 kJ/(kg*K)

	Measured			Target		Diff.to Target [%]	
f [MHz]	HP-e'	HP-e"	sigma	eps	sigma	Δ-eps	Δ-sigma
700	42.9	19.58	0.76	42.2	0.89	1.6	-14.3
725	42.6	19.52	0.79	42.1	0.89	1.2	-11.7
750	42.3	19.47	0.81	41.9	0.89	0.8	-9.1
775	41.9	19.35	0.83	41.8	0.90	0.3	-6.8
800	41.6	19.23	0.86	41.7	0.90	-0.3	-4.6
825	41.3	19.18	0.88	41.6	0.91	-0.7	-2.9
838	41.1	19.16	0.89	41.5	0.91	-1.0	-2.1
850	41.0	19.13	0.90	41.5	0.92	-1.2	-1.2
875	40.7	19.07	0.93	41.5	0.94	-1.9	-1.6
900	40.4	19.00	0.95	41.5	0.97	-2.7	-1.9
925	40.1	18.92	0.97	41.5	0.98	-3.3	-0.9
950	39.8	18.85	1.00	41.4	0.99	-3.9	0.2
975	39.6	18.82	1.02	41.4	1.00	-4.4	1.6
1000	39.3	18.80	1.05	41.3	1.01	-5.0	3.0
1025	39.0	18.71	1.07	41.3	1.03	-5.5	4.0
1050	38.8	18.62	1.09	41.2	1.04	-6.0	5.0
1075	38.5	18.59	1.11	41.2	1.05	-6.5	6.3
1100	38.3	18.55	1.14	41.2	1.06	-7.0	7.5
1125	38.0	18.50	1.16	41.1	1.07	-7.5	8.5
1150	37.8	18.44	1.18	41.1	1.08	-8.0	9.6
1175	37.5	18.39	1.20	41.0	1.09	-8.4	10.6
1200	37.3	18.35	1.22	41.0	1.10	-8.9	11.6





Schmid & Partner Engineering AG
s p e a g

Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
info@speag.com, http://www.speag.com

Measurement Certificate / Material Test

Item Name	**Head Tissue Simulating Liquid (HSL1750V2)**
Product No.	SL AAH 175 (Charge: 120907-2)
Manufacturer	SPEAG

Measurement Method

TSL dielectric parameters measured using calibrated OCP probe.

Setup Validation

Validation results were within ± 2.5% towards the target values of Methanol.

Target Parameters

Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

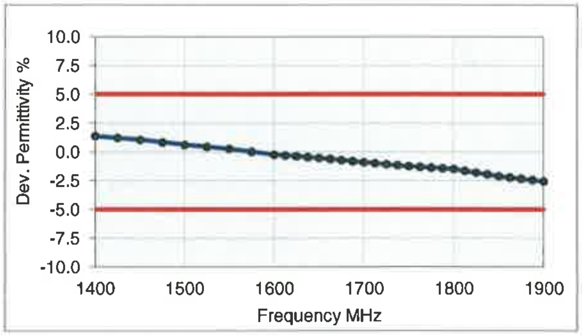
Test Condition

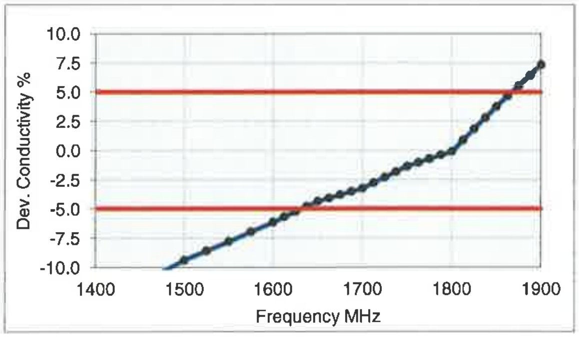
Ambient	Environment temperatur (22 ± 3)°C and humidity < 70%.
TSL Temperature	22°C
Test Date	13-Sep-12
Operator	CL

Additional Information

TSL Density	0.998 g/cm^3
TSL Heat-capacity	3.572 kJ/(kg*K)

	Measured			Target		Diff.to Target [%]	
f [MHz]	**HP-e'**	**HP-e"**	**sigma**	eps	sigma	**Δ-eps**	**Δ-sigma**
1400	41.2	13.09	1.02	40.6	1.18	1.4	-13.6
1425	41.0	13.14	1.04	40.5	1.19	1.2	-12.4
1450	40.9	13.19	1.06	40.5	1.20	1.1	-11.3
1475	40.8	13.26	1.09	40.5	1.21	0.8	-10.3
1500	40.7	13.34	1.11	40.4	1.23	0.6	-9.4
1525	40.6	13.39	1.14	40.4	1.24	0.4	-8.6
1550	40.5	13.44	1.16	40.4	1.26	0.3	-7.8
1575	40.3	13.49	1.18	40.3	1.27	0.0	-6.9
1600	40.2	13.55	1.21	40.3	1.28	-0.2	-6.1
1613	40.2	13.58	1.22	40.3	1.29	-0.3	-5.7
1625	40.1	13.62	1.23	40.3	1.30	-0.4	-5.2
1638	40.1	13.65	1.24	40.3	1.31	-0.5	-4.8
1650	40.0	13.68	1.26	40.2	1.31	-0.5	-4.3
1663	40.0	13.70	1.27	40.2	1.32	-0.6	-4.1
1675	39.9	13.71	1.28	40.2	1.33	-0.7	-3.8
1688	39.8	13.72	1.29	40.2	1.33	-0.8	-3.5
1700	39.8	13.73	1.30	40.2	1.34	-0.9	-3.2
1713	39.7	13.77	1.31	40.1	1.35	-1.0	-2.7
1725	39.7	13.81	1.33	40.1	1.36	-1.1	-2.3
1738	39.6	13.85	1.34	40.1	1.36	-1.2	-1.8
1750	39.6	13.89	1.35	40.1	1.37	-1.3	-1.4
1763	39.5	13.91	1.36	40.1	1.38	-1.3	-1.0
1775	39.5	13.93	1.38	40.0	1.39	-1.4	-0.7
1788	39.4	13.95	1.39	40.0	1.39	-1.4	-0.4
1800	39.4	13.97	1.40	40.0	1.40	-1.5	-0.1
1813	39.3	14.01	1.41	40.0	1.40	-1.7	0.9
1825	39.3	14.04	1.43	40.0	1.40	-1.8	1.8
1838	39.2	14.08	1.44	40.0	1.40	-2.0	2.8
1850	39.2	14.11	1.45	40.0	1.40	-2.1	3.8
1863	39.1	14.14	1.47	40.0	1.40	-2.2	4.7
1875	39.1	14.17	1.48	40.0	1.40	-2.3	5.6
1888	39.0	14.19	1.49	40.0	1.40	-2.5	6.5
1900	39.0	14.22	1.50	40.0	1.40	-2.6	7.4





Schmid & Partner Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
info@speag.com, http://www.speag.com

Measurement Certificate / Material Test

Item Name	**Head Tissue Simulating Liquid (HSL 1900)**
Product No.	SL AAH 190 AA (Charge: 120112-1)
Manufacturer	SPEAG

Measurement Method

TSL dielectric parameters measured using calibrated OCP probe (type DAK).

Target Parameters

Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

Test Condition

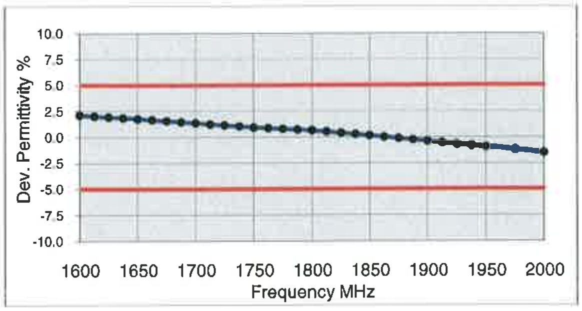
Ambient Condition	22°C ; 30% humidity
TSL Temperature	22°C
Test Date	18-Jan-12

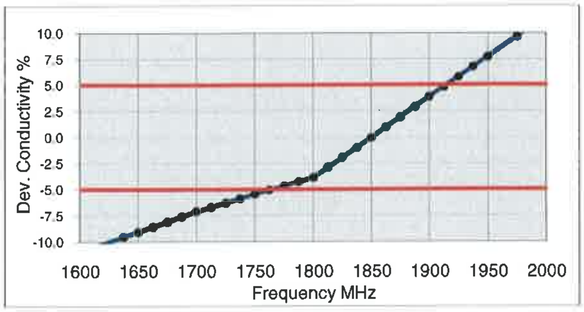
Additional Information

TSL Density	0.985 g/cm^3
TSL Heat-capacity	3.710 kJ/(kg*K)

Results

	Measured			Target		Diff.to Target [%]	
f [MHz]	**HP-e'**	**HP-e"**	**sigma**	eps	sigma	**Δ-eps**	**Δ-sigma**
1600	41.2	12.84	1.14	40.3	1.28	2.1	-11.0
1613	41.1	12.88	1.16	40.3	1.29	2.0	-10.5
1625	41.1	12.93	1.17	40.3	1.30	1.9	-10.0
1638	41.0	12.97	1.18	40.3	1.31	1.8	-9.5
1650	40.9	13.01	1.19	40.2	1.31	1.8	-9.1
1663	40.9	13.05	1.21	40.2	1.32	1.7	-8.6
1675	40.8	13.10	1.22	40.2	1.33	1.6	-8.1
1688	40.8	13.14	1.23	40.2	1.33	1.4	-7.6
1700	40.7	13.18	1.25	40.2	1.34	1.3	-7.1
1713	40.6	13.22	1.26	40.1	1.35	1.2	-6.7
1725	40.6	13.25	1.27	40.1	1.36	1.1	-6.3
1738	40.5	13.28	1.28	40.1	1.36	1.0	-5.9
1750	40.5	13.31	1.30	40.1	1.37	0.9	-5.5
1763	40.4	13.35	1.31	40.1	1.38	0.9	-5.1
1775	40.4	13.38	1.32	40.0	1.39	0.8	-4.7
1788	40.3	13.41	1.33	40.0	1.39	0.7	-4.3
1800	**40.3**	**13.44**	**1.35**	**40.0**	**1.40**	**0.6**	**-3.9**
1813	40.2	13.48	1.36	40.0	1.40	0.5	-2.9
1825	40.2	13.52	1.37	40.0	1.40	0.4	-2.0
1838	40.1	13.55	1.39	40.0	1.40	0.3	-1.0
1850	40.1	13.59	1.40	40.0	1.40	0.1	-0.1
1863	40.0	13.63	1.41	40.0	1.40	0.0	0.9
1875	39.9	13.67	1.43	40.0	1.40	-0.1	1.9
1888	39.9	13.71	1.44	40.0	1.40	-0.3	2.9
1900	**39.8**	**13.75**	**1.45**	**40.0**	**1.40**	**-0.4**	**3.8**
1913	39.8	13.79	1.47	40.0	1.40	-0.5	4.8
1925	39.7	13.83	1.48	40.0	1.40	-0.7	5.8
1938	39.7	13.86	1.49	40.0	1.40	-0.8	6.7
1950	39.6	13.90	1.51	40.0	1.40	-0.9	7.7
1975	39.5	13.97	1.53	40.0	1.40	-1.2	9.6
2000	39.4	14.04	1.56	40.0	1.40	-1.5	11.6





Schmid & Partner Engineering AG
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Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
info@speag.com, http://www.speag.com

Measurement Certificate / Material Test

Item Name	**Head Tissue Simulating Liquid (HSL1950V2)**
Product No.	SL AAH 195 CA (Charge: 120717-3)
Manufacturer	SPEAG

Measurement Method

TSL dielectric parameters measured using calibrated OCP probe.

Setup Validation

Validation results were within ± 2.5% towards the target values of Methanol.

Target Parameters

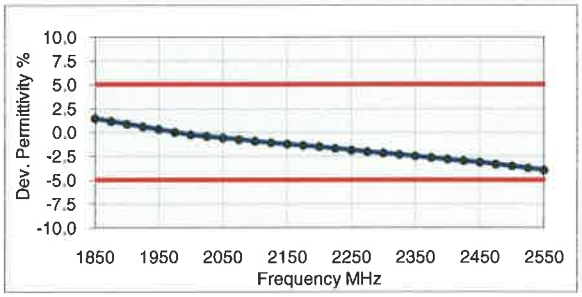
Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

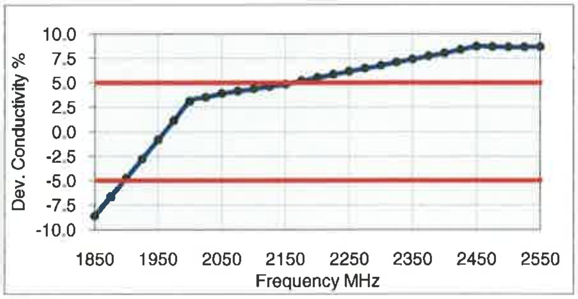
Test Condition

Ambient	Environment temperatur (22 ± 3)°C and humidity < 70%.
TSL Temperature	22°C
Test Date	18-Jul-12
Operator	DI

TSL Density	0.995 g/cm^3
TSL Heat-capacity	3.720 kJ/(kg*K)

	Measured			Target		Diff.to Target [%]	
f [MHz]	**HP-e'**	**HP-e"**	**sigma**	**eps**	**sigma**	**Δ-eps**	**Δ-sigma**
1850	40.6	12.43	1.28	40.0	1.40	1.5	-8.6
1875	40.5	12.53	1.31	40.0	1.40	1.2	-6.7
1900	40.3	12.62	1.33	40.0	1.40	0.9	-4.7
1925	40.2	12.71	1.36	40.0	1.40	0.6	-2.8
1950	40.1	12.80	1.39	40.0	1.40	0.3	-0.8
1975	40.0	12.89	1.42	40.0	1.40	0.0	1.1
2000	39.9	12.98	1.44	40.0	1.40	-0.3	3.1
2025	39.8	13.07	1.47	40.0	1.42	-0.4	3.5
2050	39.7	13.16	1.50	39.9	1.44	-0.6	3.9
2075	39.6	13.23	1.53	39.9	1.47	-0.8	4.2
2100	39.5	13.30	1.55	39.8	1.49	-0.9	4.4
2125	39.3	13.37	1.58	39.8	1.51	-1.1	4.6
2150	39.2	13.44	1.61	39.7	1.53	-1.2	4.9
2175	39.1	13.52	1.64	39.7	1.56	-1.4	5.2
2200	39.1	13.61	1.67	39.6	1.58	-1.5	5.5
2225	38.9	13.68	1.69	39.6	1.60	-1.7	5.9
2250	38.8	13.76	1.72	39.6	1.62	-1.9	6.2
2275	38.7	13.83	1.75	39.5	1.64	-2.0	6.5
2300	38.6	13.91	1.78	39.5	1.67	-2.2	6.8
2325	38.5	13.98	1.81	39.4	1.69	-2.3	7.1
2350	38.4	14.06	1.84	39.4	1.71	-2.5	7.4
2375	38.3	14.13	1.87	39.3	1.73	-2.7	7.7
2400	38.2	14.21	1.90	39.3	1.76	-2.8	8.0
2425	38.1	14.28	1.93	39.2	1.78	-3.0	8.4
2450	38.0	14.36	1.96	39.2	1.80	-3.1	8.7
2475	37.9	14.42	1.99	39.2	1.83	-3.3	8.7
2500	37.8	14.49	2.02	39.1	1.85	-3.5	8.7
2525	37.6	14.56	2.04	39.1	1.88	-3.7	8.7
2550	37.5	14.62	2.07	39.1	1.91	-3.9	8.7
2575	37.4	14.69	2.10	39.0	1.94	-4.1	8.7
2600	37.3	14.76	2.13	39.0	1.96	-4.3	8.7





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Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
info@speag.com, http://www.speag.com

Measurement Certificate / Material Test

Item Name	**Head Tissue Simulating Liquid (HSL2450V2)**
Product No.	SL AAH 245 BA (Charge: 130430-3)
Manufacturer	SPEAG

Measurement Method

TSL dielectric parameters measured using calibrated OCP probe.

Setup Validation

Validation results were within ± 2.5% towards the target values of Methanol.

Target Parameters

Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

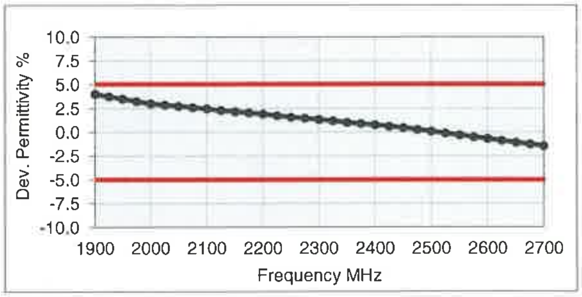
Test Condition

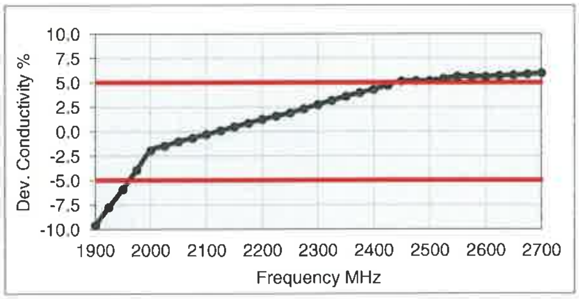
Ambient	Environment temperatur (22 ± 3)°C and humidity < 70%.
TSL Temperature	23°C
Test Date	2-May-13
Operator	CL

Additional Information

TSL Density	0.988 g/cm^3
TSL Heat-capacity	3.680 kJ/(kg*K)

	Measured			Target		Diff.to Target [%]	
f [MHz]	**HP-e'**	**HP-e''**	**sigma**	eps	sigma	**Δ-eps**	**Δ-sigma**
1900	41.6	11.98	1.27	40.0	1.40	4.0	-9.6
1925	41.5	12.06	1.29	40.0	1.40	3.8	-7.7
1950	41.4	12.15	1.32	40.0	1.40	3.5	-5.9
1975	41.3	12.24	1.35	40.0	1.40	3.3	-3.9
2000	41.2	12.34	1.37	40.0	1.40	3.0	-1.9
2025	41.1	12.44	1.40	40.0	1.42	2.9	-1.5
2050	41.0	12.54	1.43	39.9	1.44	2.8	-1.0
2075	40.9	12.62	1.46	39.9	1.47	2.6	-0.6
2100	40.8	12.71	1.48	39.8	1.49	2.5	-0.3
2125	40.7	12.80	1.51	39.8	1.51	2.3	0.1
2150	40.6	12.88	1.54	39.7	1.53	2.2	0.5
2175	40.5	12.97	1.57	39.7	1.56	2.0	0.9
2200	40.4	13.05	1.60	39.6	1.58	1.9	1.3
2225	40.3	13.13	1.63	39.6	1.60	1.7	1.6
2250	40.2	13.21	1.65	39.6	1.62	1.6	1.9
2275	40.1	13.30	1.68	39.5	1.64	1.5	2.4
2300	**40.0**	**13.39**	**1.71**	**39.5**	**1.67**	**1.3**	**2.8**
2325	39.9	13.48	1.74	39.4	1.69	1.2	3.2
2350	39.8	13.56	1.77	39.4	1.71	1.0	3.6
2375	39.7	13.64	1.80	39.3	1.73	0.9	4.0
2400	39.6	13.72	1.83	39.3	1.76	0.8	4.3
2425	39.5	13.80	1.86	39.2	1.78	0.6	4.8
2450	**39.4**	**13.89**	**1.89**	**39.2**	**1.80**	**0.5**	**5.2**
2475	39.3	13.96	1.92	39.2	1.83	0.3	5.2
2500	39.2	14.03	1.95	39.1	1.85	0.1	5.2
2525	39.1	14.12	1.98	39.1	1.88	-0.1	5.4
2550	39.0	14.22	2.02	39.1	1.91	-0.3	5.6
2575	38.9	14.28	2.05	39.0	1.94	-0.5	5.6
2600	**38.7**	**14.34**	**2.07**	**39.0**	**1.96**	**-0.7**	**5.6**
2625	38.6	14.41	2.10	39.0	1.99	-0.9	5.7
2650	38.5	14.48	2.13	38.9	2.02	-1.1	5.8
2675	38.4	14.55	2.17	38.9	2.05	-1.3	5.9
2700	38.3	14.62	2.20	38.9	2.07	-1.4	6.0





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Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
info@speag.com, http://www.speag.com

Measurement Certificate / Material Test

Item Name	**Head Tissue Simulating Liquid (HBBL1550-1950V3)**
Product No.	SL AAH 181 AA (Charge: 140206-3)
Manufacturer	SPEAG

Measurement Method

TSL dielectric parameters measured using calibrated OCP probe.

Setup Validation

Validation results were within ± 2.5% towards the target values of Methanol.

Target Parameters

Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

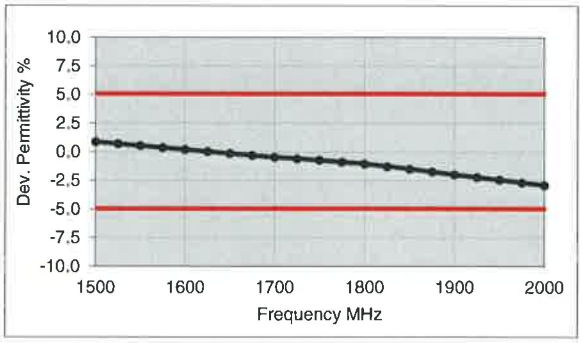
Test Condition

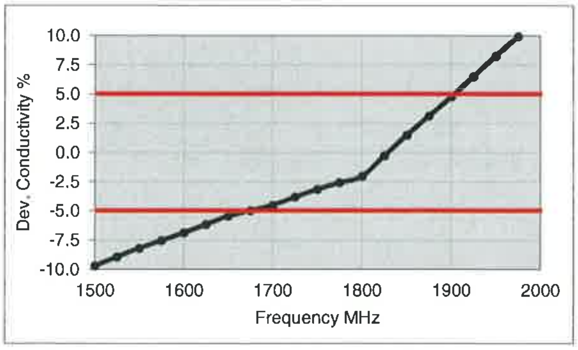
Ambient	Environment temperatur (22 ± 3)°C and humidity < 70%.
TSL Temperature	22°C
Test Date	12-Feb-14
Operator	IEN

Additional Information

TSL Density	1.052 g/cm^3
TSL Heat-capacity	3.322 kJ/(kg*K)

	Measured			Target		Diff.to Target [%]	
f [MHz]	HP-e'	HP-e"	sigma	eps	sigma	Δ-eps	Δ-sigma
1500	40.8	13.29	1.11	40.4	1.23	0.9	-9.7
1525	40.7	13.34	1.13	40.4	1.24	0.7	-8.9
1550	40.6	13.38	1.15	40.4	1.26	0.6	-8.2
1575	40.5	13.41	1.17	40.3	1.27	0.4	-7.5
1600	40.4	13.44	1.20	40.3	1.28	0.2	-6.9
1625	40.3	13.48	1.22	40.3	1.30	0.1	-6.2
1650	40.2	13.53	1.24	40.2	1.31	-0.1	-5.4
1675	40.1	13.54	1.26	40.2	1.33	-0.3	-5.0
1700	40.0	13.55	1.28	40.2	1.34	-0.4	-4.5
1725	39.9	13.60	1.30	40.1	1.36	-0.6	-3.8
1750	39.8	13.64	1.33	40.1	1.37	-0.7	-3.1
1775	39.7	13.67	1.35	40.0	1.39	-0.9	-2.6
1800	39.6	13.70	1.37	40.0	1.40	-1.0	-2.0
1825	39.5	13.75	1.40	40.0	1.40	-1.2	-0.3
1850	39.4	13.81	1.42	40.0	1.40	-1.5	1.5
1875	39.3	13.84	1.44	40.0	1.40	-1.7	3.1
1900	39.2	13.88	1.47	40.0	1.40	-2.0	4.8
1925	39.1	13.92	1.49	40.0	1.40	-2.2	6.5
1950	39.0	13.97	1.52	40.0	1.40	-2.4	8.3
1975	38.9	14.01	1.54	40.0	1.40	-2.6	10.0
2000	38.8	14.05	1.56	40.0	1.40	-2.9	11.6





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Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
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Measurement Certificate / Material Test

Item Name	**Head Tissue Simulating Liquid (HBBL1900-3800V3)**
Product No.	SL AAH 196 AB (Charge: 131212-1)
Manufacturer	SPEAG

Measurement Method

TSL dielectric parameters measured using calibrated OCP probe.

Setup Validation

Validation results were within ± 2.5% towards the target values of Methanol.

Target Parameters

Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

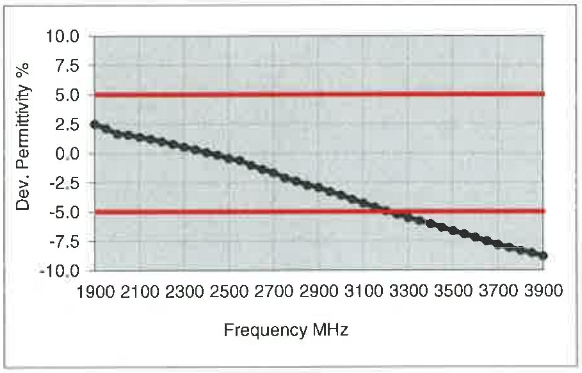
Test Condition

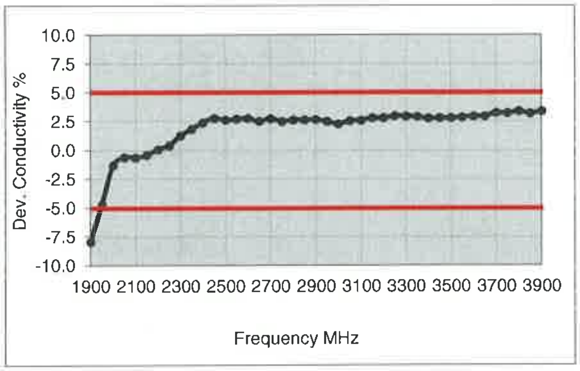
Ambient	Environment temperatur (22 ± 3)°C and humidity < 70%.
TSL Temperature	22°C
Test Date	18-Dec-13
Operator	IEN

Additional Information

TSL Density	1.054 g/cm^3
TSL Heat-capacity	3.389 kJ/(kg*K)

	Measured			Target		Diff.to Target [%]	
f [MHz]	**HP-e'**	**HP-e"**	**sigma**	**eps**	**sigma**	**Δ-eps**	**Δ-sigma**
1900	41.0	12.2	1.3	40.0	1.4	2.5	-7.9
1950	40.8	12.3	1.3	40.0	1.4	2.1	-4.7
2000	40.7	12.4	1.4	40.0	1.4	1.7	-1.3
2050	40.5	12.6	1.4	39.9	1.4	1.6	-0.6
2100	40.4	12.7	1.5	39.8	1.5	1.4	-0.6
2150	40.2	12.8	1.5	39.7	1.5	1.2	-0.4
2200	40.0	12.9	1.6	39.6	1.6	1.0	0.1
2250	39.9	13.0	1.6	39.6	1.6	0.8	0.4
2300	39.7	13.2	1.7	39.5	1.7	0.5	1.3
2350	39.5	13.3	1.7	39.4	1.7	0.3	1.8
2400	39.3	13.5	1.8	39.3	1.8	0.1	2.4
2450	39.1	13.6	1.9	39.2	1.8	-0.1	2.8
2500	39.0	13.7	1.9	39.1	1.9	-0.4	2.6
2550	38.8	13.8	2.0	39.1	1.9	-0.6	2.7
2600	38.6	14.0	2.0	39.0	2.0	-1.0	2.8
2650	38.4	14.0	2.1	38.9	2.0	-1.4	2.5
2700	38.2	14.2	2.1	38.9	2.1	-1.7	2.7
2750	38.0	14.3	2.2	38.8	2.1	-2.1	2.5
2800	37.8	14.4	2.2	38.8	2.2	-2.4	2.6
2850	37.6	14.5	2.3	38.7	2.2	-2.7	2.6
2900	37.5	14.6	2.4	38.6	2.3	-2.9	2.6
2950	37.3	14.6	2.4	38.6	2.3	-3.3	2.5
3000	37.1	14.7	2.5	38.5	2.4	-3.6	2.3
3050	36.9	14.8	2.5	38.4	2.5	-3.9	2.6
3100	36.7	14.9	2.6	38.4	2.5	-4.3	2.6
3150	36.6	15.0	2.6	38.3	2.6	-4.6	2.8
3200	36.4	15.0	2.7	38.3	2.6	-4.9	2.8
3250	36.2	15.1	2.7	38.2	2.7	-5.2	3.0
3300	36.1	15.2	2.8	38.2	2.7	-5.5	3.0
3350	35.9	15.2	2.8	38.1	2.8	-5.8	2.9
3400	35.7	15.3	2.9	38.0	2.8	-6.0	2.8
3450	35.6	15.3	2.9	38.0	2.9	-6.3	2.8
3500	35.4	15.4	3.0	37.9	2.9	-6.6	2.8
3550	35.3	15.4	3.0	37.9	3.0	-6.9	2.9
3600	35.1	15.5	3.1	37.8	3.0	-7.2	2.9
3650	34.9	15.5	3.2	37.8	3.1	-7.5	2.9
3700	34.7	15.6	3.2	37.7	3.1	-7.8	3.2
3750	34.6	15.7	3.3	37.6	3.2	-8.1	3.2
3800	34.5	15.7	3.3	37.6	3.2	-8.3	3.4
3850	34.3	15.8	3.4	37.5	3.3	-8.5	3.2





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Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
info@speag.com, http://www.speag.com

Measurement Certificate / Material Test

Item Name	**Head Tissue Simulating Liquid (HBBL3500-5800V5)**
Product No.	SL AAH 502 AB (Charge: 130123-1)
Manufacturer	SPEAG

Measurement Method

TSL dielectric parameters measured using calibrated OCP probe.

Setup Validation

Validation results were within ± 2.5% towards the target values of Methanol.

Target Parameters

Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

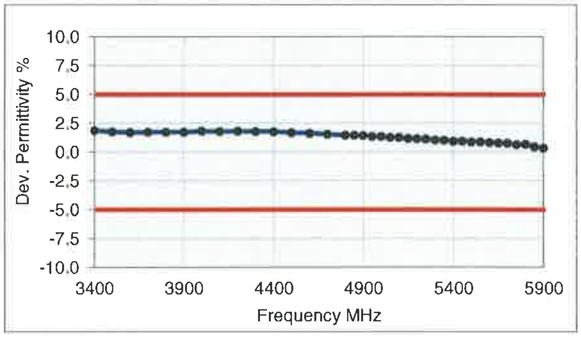
Test Condition

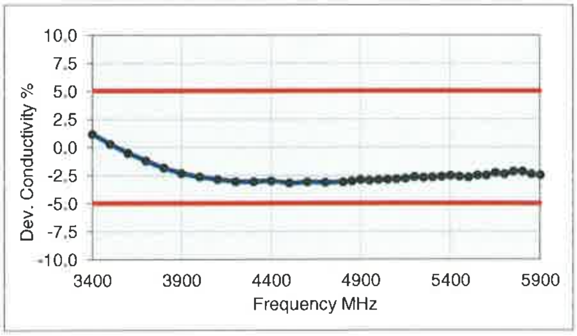
Ambient	Environment temperatur (22 ± 3)°C and humidity < 70%.
TSL Temperature	22°C
Test Date	23-Jan-13
Operator	DI

Additional Information

TSL Density	0.985 g/cm^3
TSL Heat-capacity	3.383 kJ/(kg*K)

	Measured			Target		Diff.to Target [%]	
f [MHz]	**HP-e'**	**HP-e''**	**sigma**	eps	sigma	**Δ-eps**	**Δ-sigma**
3400	38.8	15.03	2.84	38.0	2.81	1.9	1.2
3500	**38.6**	**15.00**	**2.92**	**37.9**	**2.91**	**1.8**	**0.3**
3600	38.5	14.98	3.00	37.8	3.02	1.7	-0.5
3700	**38.4**	**14.97**	**3.08**	**37.7**	**3.12**	**1.7**	**-1.2**
3800	38.2	14.95	3.16	37.6	3.22	1.7	-1.8
3900	38.1	14.96	3.25	37.5	3.32	1.7	-2.3
4000	38.0	14.99	3.34	37.4	3.43	1.8	-2.6
4100	37.9	15.03	3.43	37.2	3.53	1.8	-2.8
4200	37.8	15.06	3.52	37.1	3.63	1.8	-3.0
4300	37.7	15.13	3.62	37.0	3.73	1.8	-3.1
4400	37.6	15.20	3.72	36.9	3.84	1.8	-3.0
4500	37.4	15.23	3.81	36.8	3.94	1.7	-3.2
4600	37.3	15.30	3.92	36.7	4.04	1.6	-3.1
4700	37.1	15.35	4.01	36.6	4.14	1.5	-3.1
4800	37.0	15.41	4.11	36.4	4.25	1.5	-3.1
4850	36.9	15.45	4.17	36.4	4.30	1.5	-3.0
4900	36.8	15.49	4.22	36.3	4.35	1.4	-2.9
4950	36.8	15.51	4.27	36.3	4.40	1.4	-2.9
5000	36.7	15.54	4.32	36.2	4.45	1.4	-2.9
5050	36.6	15.57	4.37	36.2	4.50	1.3	-2.8
5100	36.6	15.60	4.42	36.1	4.55	1.3	-2.8
5150	36.5	15.63	4.48	36.0	4.60	1.2	-2.7
5200	**36.4**	**15.67**	**4.53**	**36.0**	**4.66**	**1.2**	**-2.6**
5250	36.3	15.68	4.58	35.9	4.71	1.1	-2.7
5300	36.2	15.71	4.63	35.9	4.76	1.0	-2.6
5350	36.2	15.74	4.68	35.8	4.81	1.0	-2.6
5400	36.1	15.78	4.74	35.8	4.86	0.9	-2.5
5450	36.0	15.78	4.78	35.7	4.91	0.9	-2.6
5500	**36.0**	**15.79**	**4.83**	**35.6**	**4.96**	**0.9**	**-2.6**
5550	35.9	15.84	4.89	35.6	5.01	0.9	-2.5
5600	35.8	15.86	4.94	35.5	5.07	0.8	-2.5
5650	35.8	15.91	5.00	35.5	5.12	0.8	-2.2
5700	35.7	15.91	5.05	35.4	5.17	0.8	-2.4
5750	35.6	15.97	5.11	35.4	5.22	0.7	-2.1
5800	**35.5**	**15.98**	**5.16**	**35.3**	**5.27**	**0.7**	**-2.1**
5850	35.5	16.01	5.21	35.3	5.34	0.5	-2.4
5900	35.4	16.05	5.27	35.3	5.40	0.3	-2.4





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Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
info@speag.com, http://www.speag.com

Measurement Certificate / Material Test

Item Name	**Body Tissue Simulating Liquid (MSL750V2)**
Product No.	SL AAM 075 (Charge: 120831-2)
Manufacturer	SPEAG

Measurement Method

TSL dielectric parameters measured using calibrated OCP probe.

Setup Validation

Validation results were within ± 2.5% towards the target values of Methanol.

Target Parameters

Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

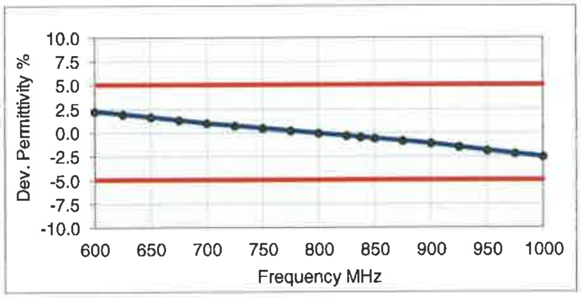
Test Condition

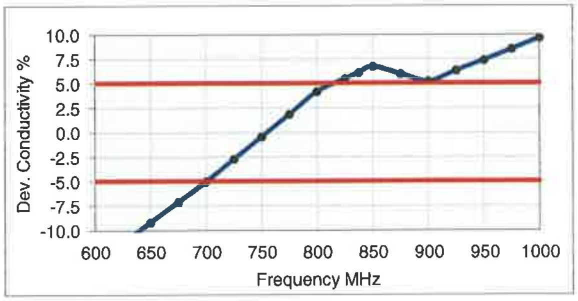
Ambient	Environment temperatur (22 ± 3)°C and humidity < 70%.
TSL Temperature	22°C
Test Date	5-Sep-12
Operator	CL

Additional Information

TSL Density	1.212 g/cm^3
TSL Heat-capacity	3.006 kJ/(kg*K)

	Measured			Target		Diff.to Target [%]	
f [MHz]	**HP-e'**	**HP-e"**	**sigma**	**eps**	**sigma**	**Δ-eps**	**Δ-sigma**
600	57.4	24.67	0.82	56.1	0.95	2.2	-13.5
625	57.1	24.34	0.85	56.0	0.95	1.9	-11.3
650	56.8	24.01	0.87	55.9	0.96	1.6	-9.1
675	56.6	23.71	0.89	55.8	0.96	1.3	-7.1
700	56.3	23.41	0.91	55.7	0.96	1.0	-5.0
725	56.0	23.20	0.94	55.6	0.96	0.7	-2.7
750	55.8	22.99	0.96	55.5	0.96	0.5	-0.4
775	55.5	22.81	0.98	55.4	0.97	0.2	1.9
800	55.3	22.64	1.01	55.3	0.97	-0.1	4.2
825	55.1	22.47	1.03	55.2	0.98	-0.3	5.5
838	54.9	22.39	1.04	55.2	0.98	-0.5	6.1
850	54.8	22.31	1.05	55.2	0.99	-0.6	6.7
875	54.6	22.19	1.08	55.1	1.02	-0.9	6.0
900	54.4	22.07	1.10	55.0	1.05	-1.1	5.2
925	54.1	21.96	1.13	55.0	1.06	-1.5	6.3
950	53.9	21.85	1.15	54.9	1.08	-1.9	7.4
975	53.7	21.75	1.18	54.9	1.09	-2.2	8.5
1000	53.5	21.64	1.20	54.8	1.10	-2.5	9.6





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Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
info@speag.com, http://www.speag.com

Measurement Certificate / Material Test

Item Name	**Body Tissue Simulating Liquid (MSL900V2)**
Product No.	SL AAM 090 CA (Charge: 140124-1)
Manufacturer	SPEAG

Measurement Method

TSL dielectric parameters measured using calibrated OCP probe.

Setup Validation

Validation results were within ± 2.5% towards the target values of Methanol.

Target Parameters

Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

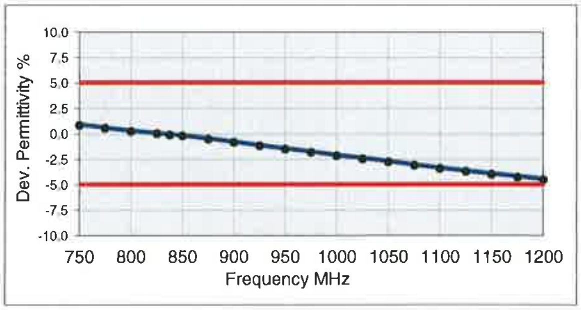
Test Condition

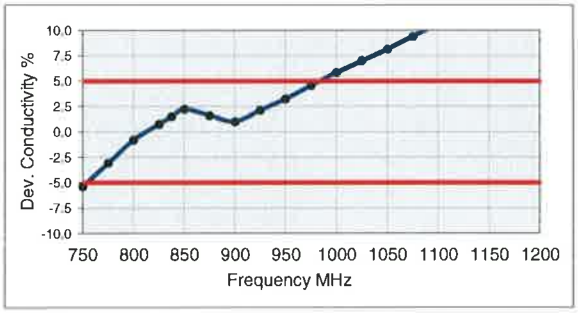
Ambient	Environment temperatur (22 ± 3)°C and humidity < 70%.
TSL Temperature	22°C
Test Date	29-Jan-14
Operator	IEN

Additional Information

TSL Density	1.208 g/cm3
TSL Heat-capacity	3.113 kJ/(kg*K)

	Measured			Target		Diff.to Target [%]	
f [MHz]	**HP-e'**	**HP-e"**	**sigma**	eps	sigma	**Δ-eps**	**Δ-sigma**
700	56.5	22.21	0.86	55.7	0.96	1.4	-9.9
725	56.3	22.03	0.89	55.6	0.96	1.1	-7.6
750	56.0	21.85	0.91	55.5	0.96	0.9	-5.4
775	55.8	21.71	0.94	55.4	0.97	0.6	-3.1
800	55.5	21.57	0.96	55.3	0.97	0.3	-0.8
825	55.3	21.47	0.99	55.2	0.98	0.1	0.8
838	**55.2**	**21.42**	**1.00**	**55.2**	**0.98**	**-0.1**	**1.5**
850	55.1	21.37	1.01	55.2	0.99	-0.2	2.2
875	54.8	21.28	1.04	55.1	1.02	-0.5	1.6
900	**54.6**	**21.19**	**1.06**	**55.0**	**1.05**	**-0.8**	**1.0**
925	54.3	21.10	1.09	55.0	1.06	-1.1	2.1
950	54.1	21.01	1.11	54.9	1.08	-1.5	3.2
975	53.9	20.96	1.14	54.9	1.09	-1.8	4.6
1000	53.7	20.90	1.16	54.8	1.10	-2.1	5.9
1025	53.5	20.82	1.19	54.8	1.11	-2.4	7.0
1050	53.3	20.75	1.21	54.7	1.12	-2.7	8.1
1075	53.0	20.70	1.24	54.7	1.13	-3.0	9.4
1100	52.8	20.66	1.26	54.7	1.14	-3.4	10.6
1125	52.6	20.57	1.29	54.6	1.15	-3.7	11.5
1150	52.4	20.48	1.31	54.6	1.17	-3.9	12.4
1175	52.2	20.47	1.34	54.5	1.18	-4.2	13.7
1200	52.0	20.46	1.37	54.5	1.19	-4.5	15.0





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Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
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Measurement Certificate / Material Test

Item Name	**Body Tissue Simulating Liquid (MSL1750V2)**
Product No.	SL AAM 175 (Charge: 120919-3)
Manufacturer	SPEAG

Measurement Method

TSL dielectric parameters measured using calibrated OCP probe.

Setup Validation

Validation results were within ± 2.5% towards the target values of Methanol.

Target Parameters

Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

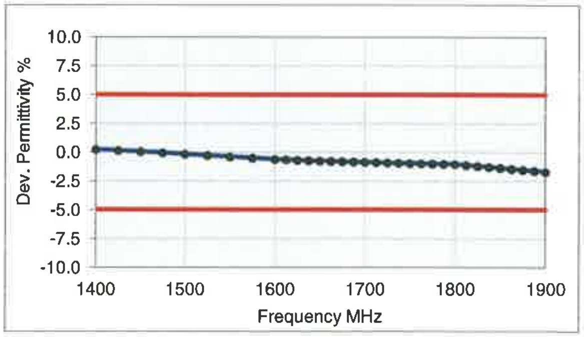
Test Condition

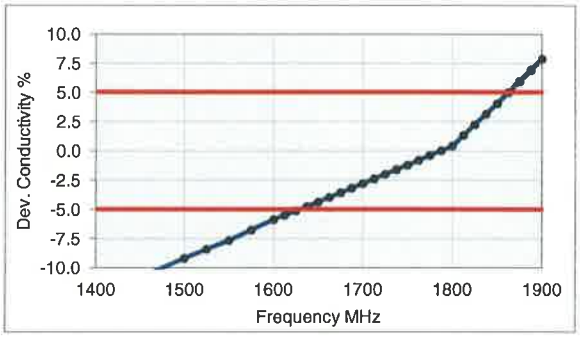
Ambient	Environment temperatur (22 ± 3)°C and humidity < 70%.
TSL Temperature	22°C
Test Date	20-Sep-12
Operator	CL

Additional Information

TSL Density	0.998 g/cm^3
TSL Heat-capacity	3.893 kJ/(kg*K)

	Measured			Target		Diff.to Target [%]	
f [MHz]	**HP-e'**	**HP-e"**	**sigma**	eps	sigma	**Δ-eps**	**Δ-sigma**
1400	54.2	14.23	1.11	54.1	1.28	0.2	-13.2
1425	54.1	14.30	1.13	54.0	1.29	0.1	-12.1
1450	54.0	14.36	1.16	54.0	1.30	0.0	-10.9
1475	53.9	14.42	1.18	54.0	1.32	-0.1	-10.0
1500	53.8	14.49	1.21	53.9	1.33	-0.2	-9.2
1525	53.7	14.54	1.23	53.9	1.35	-0.3	-8.4
1550	53.7	14.59	1.26	53.9	1.36	-0.4	-7.7
1575	53.6	14.67	1.29	53.8	1.38	-0.5	-6.8
1600	53.5	14.74	1.31	53.8	1.39	-0.6	-5.9
1613	53.4	14.77	1.32	53.8	1.40	-0.7	-5.5
1625	53.4	14.79	1.34	53.8	1.41	-0.7	-5.1
1638	53.3	14.82	1.35	53.7	1.42	-0.7	-4.7
1650	53.3	14.85	1.36	53.7	1.43	-0.8	-4.4
1663	53.2	14.88	1.38	53.7	1.43	-0.8	-4.0
1675	53.2	14.91	1.39	53.6	1.44	-0.8	-3.6
1688	53.1	14.94	1.40	53.6	1.45	-0.8	-3.2
1700	53.1	14.97	1.42	53.6	1.46	-0.9	-2.8
1713	53.1	15.01	1.43	53.5	1.46	-0.9	-2.4
1725	53.0	15.04	1.44	53.5	1.47	-0.9	-2.0
1738	53.0	15.07	1.46	53.5	1.48	-1.0	-1.6
1750	52.9	15.10	1.47	53.4	1.49	-1.0	-1.2
1763	52.9	15.14	1.48	53.4	1.50	-1.0	-0.8
1775	52.8	15.17	1.50	53.4	1.50	-1.0	-0.4
1788	52.8	15.21	1.51	53.3	1.51	-1.0	0.0
1800	52.7	15.24	1.53	53.3	1.52	-1.1	0.4
1813	52.7	15.27	1.54	53.3	1.52	-1.1	1.3
1825	52.7	15.30	1.55	53.3	1.52	-1.2	2.2
1838	52.6	15.33	1.57	53.3	1.52	-1.3	3.1
1850	52.6	15.37	1.58	53.3	1.52	-1.4	4.0
1863	52.5	15.40	1.60	53.3	1.52	-1.5	5.0
1875	52.5	15.44	1.61	53.3	1.52	-1.5	6.0
1888	52.4	15.48	1.63	53.3	1.52	-1.6	6.9
1900	52.4	15.51	1.64	53.3	1.52	-1.7	7.9





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Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
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Measurement Certificate / Material Test

Item Name	**Body Tissue Simulating Liquid (MSL1900V2)**
Product No.	SL AAM 190 (Charge: 120913-1)
Manufacturer	SPEAG

Measurement Method

TSL dielectric parameters measured using calibrated OCP probe.

Setup Validation

Validation results were within ± 2.5% towards the target values of Methanol.

Target Parameters

Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

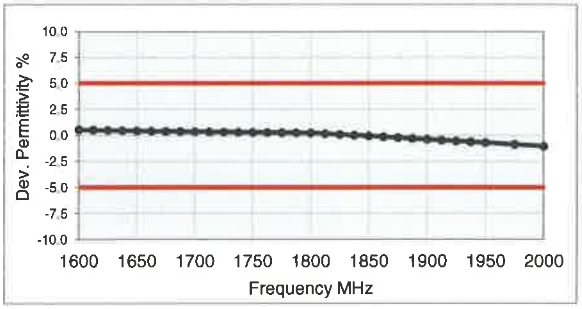
Test Condition

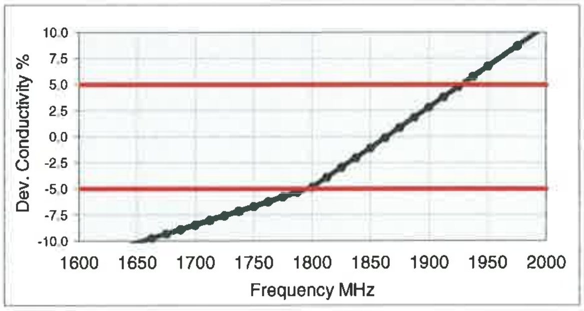
Ambient	Environment temperatur (22 ± 3)°C and humidity < 70%.
TSL Temperature	22°C
Test Date	20-Sep-12
Operator	CL

Additional Information

TSL Density	0.996 g/cm^3
TSL Heat-capacity	3.947 kJ/(kg*K)

	Measured			Target		Diff.to Target [%]	
f [MHz]	**HP-e'**	**HP-e"**	**sigma**	eps	sigma	**Δ-eps**	**Δ-sigma**
1600	54.1	13.80	1.23	53.8	1.39	0.5	-11.8
1613	54.1	13.84	1.24	53.8	1.40	0.5	-11.4
1625	54.0	13.87	1.25	53.8	1.41	0.5	-11.0
1638	54.0	13.91	1.27	53.7	1.42	0.5	-10.6
1650	53.9	13.95	1.28	53.7	1.43	0.4	-10.2
1663	53.9	13.99	1.29	53.7	1.43	0.4	-9.7
1675	53.8	14.02	1.31	53.6	1.44	0.4	-9.3
1688	53.8	14.06	1.32	53.6	1.45	0.4	-8.9
1700	53.8	14.10	1.33	53.6	1.46	0.4	-8.4
1713	53.7	14.14	1.35	53.5	1.46	0.3	-8.0
1725	53.7	14.19	1.36	53.5	1.47	0.3	-7.6
1738	53.6	14.23	1.38	53.5	1.48	0.3	-7.1
1750	53.6	14.27	1.39	53.4	1.49	0.3	-6.7
1763	53.5	14.31	1.40	53.4	1.50	0.3	-6.2
1775	53.5	14.35	1.42	53.4	1.50	0.3	-5.8
1788	53.5	14.40	1.43	53.3	1.51	0.2	-5.3
1800	53.4	14.44	1.45	53.3	1.52	0.2	-4.9
1813	53.4	14.48	1.46	53.3	1.52	0.2	-3.9
1825	53.3	14.52	1.47	53.3	1.52	0.1	-3.0
1838	53.3	14.56	1.49	53.3	1.52	0.0	-2.0
1850	53.3	14.61	1.50	53.3	1.52	-0.1	-1.1
1863	53.2	14.65	1.52	53.3	1.52	-0.1	-0.1
1875	53.2	14.69	1.53	53.3	1.52	-0.2	0.8
1888	53.1	14.74	1.55	53.3	1.52	-0.3	1.8
1900	53.1	14.78	1.56	53.3	1.52	-0.4	2.8
1913	53.0	14.83	1.58	53.3	1.52	-0.5	3.8
1925	53.0	14.87	1.59	53.3	1.52	-0.5	4.8
1938	53.0	14.91	1.61	53.3	1.52	-0.6	5.7
1950	52.9	14.95	1.62	53.3	1.52	-0.7	6.7
1975	52.8	15.03	1.65	53.3	1.52	-0.9	8.7
2000	52.7	15.11	1.68	53.3	1.52	-1.0	10.6





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Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
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Measurement Certificate / Material Test

Item Name	**Body Tissue Simulating Liquid (MSL1950V2)**
Product No.	SL AAM 195 (Charge: 120919-2)
Manufacturer	SPEAG

Measurement Method

TSL dielectric parameters measured using calibrated OCP probe.

Setup Validation

Validation results were within ± 2.5% towards the target values of Methanol.

Target Parameters

Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

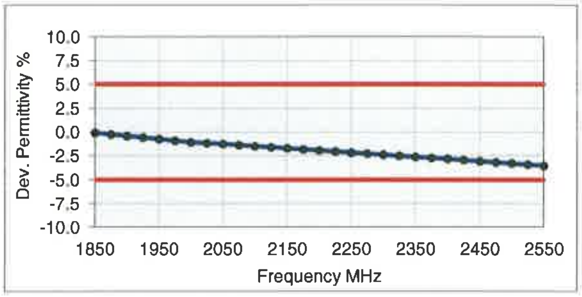
Test Condition

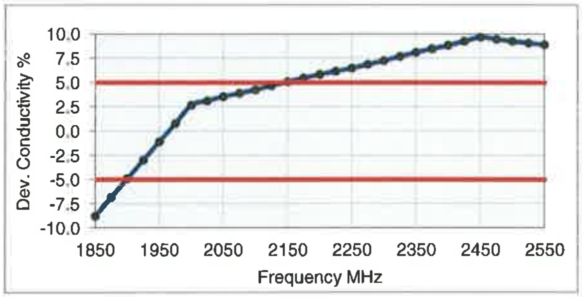
Ambient	Environment temperatur (22 ± 3)°C and humidity < 70%.
TSL Temperature	22°C
Test Date	20-Sep-12
Operator	CL

Additional Information

TSL Density	0.997 g/cm^3
TSL Heat-capacity	3.970 kJ/(kg*K)

	Measured			Target		Diff.to Target [%]	
f [MHz]	**HP-e'**	**HP-e"**	**sigma**	eps	sigma	**Δ-eps**	**Δ-sigma**
1850	53.3	13.47	1.39	53.3	1.52	-0.1	-8.8
1875	53.2	13.58	1.42	53.3	1.52	-0.2	-6.8
1900	53.1	13.68	1.45	53.3	1.52	-0.4	-4.9
1925	53.0	13.77	1.47	53.3	1.52	-0.6	-3.0
1950	52.9	13.86	1.50	53.3	1.52	-0.7	-1.1
1975	52.8	13.94	1.53	53.3	1.52	-0.9	0.8
2000	52.7	14.03	1.56	53.3	1.52	-1.1	2.7
2025	52.6	14.13	1.59	53.3	1.54	-1.2	3.1
2050	52.6	14.23	1.62	53.2	1.57	-1.3	3.5
2075	52.5	14.32	1.65	53.2	1.59	-1.4	3.9
2100	52.4	14.41	1.68	53.2	1.62	-1.5	4.2
2125	52.3	14.51	1.72	53.1	1.64	-1.6	4.7
2150	52.2	14.61	1.75	53.1	1.66	-1.7	5.1
2175	52.1	14.70	1.78	53.1	1.69	-1.8	5.5
2200	52.0	14.79	1.81	53.0	1.71	-1.9	5.8
2225	51.9	14.88	1.84	53.0	1.74	-2.0	6.1
2250	51.8	14.96	1.87	53.0	1.76	-2.2	6.5
2275	51.7	15.05	1.91	52.9	1.78	-2.3	6.9
2300	51.6	15.14	1.94	52.9	1.81	-2.4	7.2
2325	51.5	15.24	1.97	52.9	1.83	-2.5	7.7
2350	51.4	15.33	2.00	52.8	1.85	-2.6	8.1
2375	51.4	15.42	2.04	52.8	1.88	-2.7	8.5
2400	51.3	15.50	2.07	52.8	1.90	-2.8	8.8
2425	51.2	15.60	2.10	52.7	1.93	-2.9	9.2
2450	51.1	15.69	2.14	52.7	1.95	-3.1	9.7
2475	51.0	15.78	2.17	52.7	1.99	-3.2	9.4
2500	50.9	15.87	2.21	52.6	2.02	-3.3	9.2
2525	50.8	15.96	2.24	52.6	2.06	-3.4	9.1
2550	50.7	16.06	2.28	52.6	2.09	-3.5	8.9
2575	50.6	16.14	2.31	52.5	2.13	-3.7	8.7
2600	50.5	16.23	2.35	52.5	2.16	-3.9	8.6





Schmid & Partner Engineering AG
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Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
info@speag.com, http://www.speag.com

Measurement Certificate / Material Test

Item Name	**Body Tissue Simulating Liquid (MSL2450V2)**
Product No.	SL AAM 245 BA (Charge: 130510-2)
Manufacturer	SPEAG

Measurement Method

TSL dielectric parameters measured using calibrated OCP probe.

Setup Validation

Validation results were within ± 2.5% towards the target values of Methanol.

Target Parameters

Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

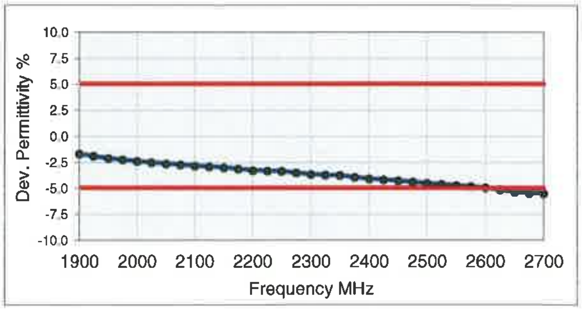
Test Condition

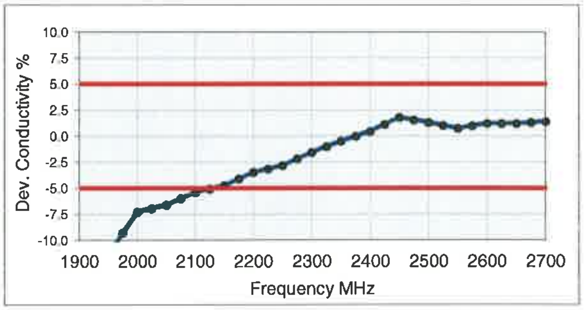
Ambient	Environment temperatur (22 ± 3)°C and humidity < 70%.
TSL Temperature	22°C
Test Date	15-May-13
Operator	IEN

Additional Information

TSL Density	0.996 g/cm^3
TSL Heat-capacity	3.987 kJ/(kg*K)

	Measured			Target		Diff.to Target [%]	
f [MHz]	**HP-e'**	**HP-e''**	**sigma**	eps	sigma	**Δ-eps**	**Δ-sigma**
1900	52.4	12.21	1.29	53.3	1.52	-1.7	-15.1
1925	52.3	12.32	1.32	53.3	1.52	-1.9	-13.2
1950	52.2	12.43	1.35	53.3	1.52	-2.1	-11.3
1975	52.1	12.55	1.38	53.3	1.52	-2.2	-9.3
2000	52.0	12.67	1.41	53.3	1.52	-2.4	-7.3
2025	51.9	12.75	1.44	53.3	1.54	-2.5	-6.9
2050	51.8	12.84	1.46	53.2	1.57	-2.6	-6.6
2075	51.7	12.96	1.50	53.2	1.59	-2.7	-6.0
2100	51.7	13.09	1.53	53.2	1.62	-2.8	-5.4
2125	51.6	13.17	1.56	53.1	1.64	-2.9	-5.0
2150	51.5	13.25	1.58	53.1	1.66	-3.0	-4.7
2175	51.4	13.37	1.62	53.1	1.69	-3.1	-4.1
2200	51.3	13.50	1.65	53.0	1.71	-3.3	-3.5
2225	51.2	13.58	1.68	53.0	1.74	-3.3	-3.1
2250	51.2	13.65	1.71	53.0	1.76	-3.3	-2.8
2275	51.1	13.78	1.74	52.9	1.78	-3.5	-2.2
2300	51.0	13.90	1.78	52.9	1.81	-3.6	-1.5
2325	50.9	14.01	1.81	52.9	1.83	-3.7	-1.0
2350	50.9	14.12	1.85	52.8	1.85	-3.8	-0.5
2375	50.7	14.21	1.88	52.8	1.88	-3.9	0.0
2400	50.6	14.31	1.91	52.8	1.90	-4.1	0.5
2425	50.5	14.44	1.95	52.7	1.93	-4.2	1.1
2450	50.5	14.56	1.99	52.7	1.95	-4.3	1.8
2475	50.4	14.64	2.02	52.7	1.99	-4.4	1.6
2500	50.3	14.72	2.05	52.6	2.02	-4.5	1.3
2525	50.2	14.79	2.08	52.6	2.06	-4.6	1.0
2550	50.1	14.86	2.11	52.6	2.09	-4.7	0.7
2575	50.0	15.00	2.15	52.5	2.13	-4.8	1.0
2600	49.9	15.14	2.19	52.5	2.16	-4.9	1.2
2625	49.8	15.23	2.22	52.5	2.20	-5.1	1.2
2650	49.6	15.33	2.26	52.4	2.23	-5.3	1.2
2675	49.6	15.45	2.30	52.4	2.27	-5.4	1.3
2700	49.5	15.56	2.34	52.4	2.30	-5.5	1.4





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Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
info@speag.com, http://www.speag.com

Measurement Certificate / Material Test

Item Name	**Body Tissue Simulating Liquid (MBBL1550-1950V3)**
Product No.	SL AAM 181 AA (Charge: 140218-3)
Manufacturer	SPEAG

Measurement Method

TSL dielectric parameters measured using calibrated OCP probe.

Setup Validation

Validation results were within ± 2.5% towards the target values of Methanol.

Target Parameters

Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

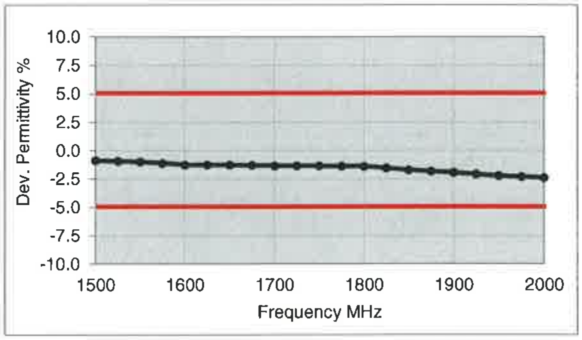
Test Condition

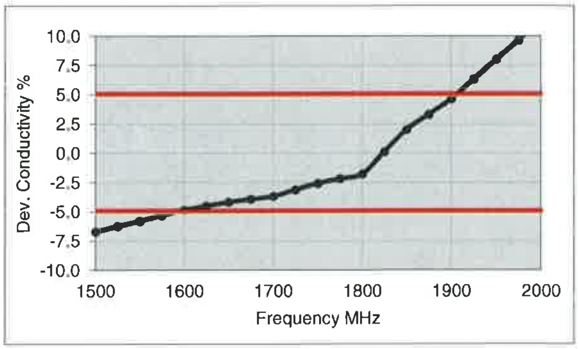
Ambient	Environment temperatur (22 ± 3)°C and humidity < 70%.
TSL Temperature	22°C
Test Date	19-Feb-14
Operator	IEN

Additional Information

TSL Density	1.042 g/cm^3
TSL Heat-capacity	3.475 kJ/(kg*K)

	Measured			Target		Diff.to Target [%]	
f [MHz]	**HP-e'**	**HP-e"**	**sigma**	eps	sigma	**Δ-eps**	**Δ-sigma**
1500	**53.5**	14.88	**1.24**	53.9	1.33	-0.9	-6.7
1525	**53.4**	14.88	**1.26**	53.9	1.35	-0.9	-6.2
1550	**53.4**	14.89	**1.28**	53.9	1.36	-1.0	-5.8
1575	**53.2**	14.89	**1.30**	53.8	1.38	-1.1	-5.3
1600	**53.1**	14.90	**1.33**	53.8	1.39	-1.2	-4.8
1625	**53.1**	14.89	**1.35**	53.8	1.41	-1.2	-4.5
1650	53.0	14.88	1.37	53.7	1.43	-1.3	-4.2
1675	**52.9**	14.86	**1.38**	53.6	1.44	-1.3	-3.9
1700	**52.9**	14.84	**1.40**	53.6	1.46	-1.3	-3.7
1725	**52.8**	14.87	**1.43**	53.5	1.47	-1.3	-3.1
1750	52.7	14.90	1.45	53.4	1.49	-1.4	-2.6
1775	**52.6**	14.90	**1.47**	53.4	1.50	-1.4	-2.2
1800	52.6	14.91	1.49	53.3	1.52	-1.4	-1.8
1825	**52.5**	14.99	**1.52**	53.3	1.52	-1.5	0.1
1850	**52.4**	15.07	**1.55**	53.3	1.52	-1.7	2.0
1875	**52.3**	15.06	**1.57**	53.3	1.52	-1.8	3.3
1900	52.3	15.05	1.59	53.3	1.52	-1.9	4.6
1925	**52.2**	15.09	**1.62**	53.3	1.52	-2.1	6.3
1950	52.1	15.13	1.64	53.3	1.52	-2.2	8.0
1975	**52.1**	15.17	**1.67**	53.3	1.52	-2.3	9.7
2000	**52.0**	15.21	**1.69**	53.3	1.52	-2.4	11.3





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Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
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Measurement Certificate / Material Test

Item Name	**Body Tissue Simulating Liquid (MBBL1900-3800V3)**
Product No.	SL AAM 196 AB (Charge: 140219-3)
Manufacturer	SPEAG

Measurement Method

TSL dielectric parameters measured using calibrated OCP probe.

Setup Validation

Validation results were within ± 2.5% towards the target values of Methanol.

Target Parameters

Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

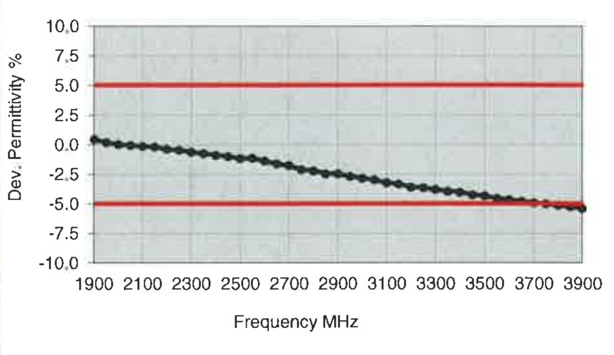
Test Condition

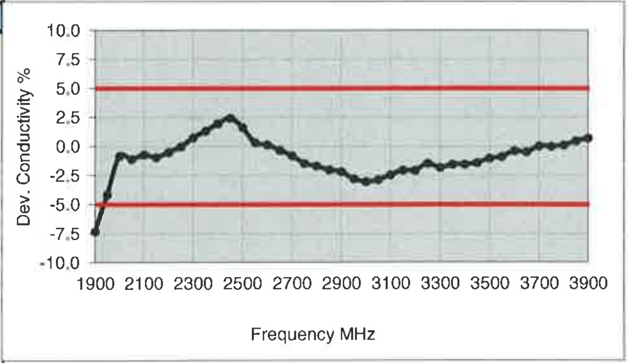
Ambient	Environment temperatur (22 ± 3)°C and humidity < 70%.
TSL Temperature	22°C
Test Date	19-Feb-14
Operator	IEN

Additional Information

TSL Density	1.036 g/cm^3
TSL Heat-capacity	3.508 kJ/(kg*K)

	Measured			Target		Diff.to Target [%]	
f [MHz]	HP-e'	HP-e"	sigma	eps	sigma	Δ-eps	Δ-sigma
1900	53.5	13.3	1.41	53.3	1.52	0.5	-7.3
1950	53.4	13.4	1.46	53.3	1.52	0.2	-4.1
2000	53.3	13.5	1.51	53.3	1.52	0.0	-0.8
2050	53.2	13.6	1.55	53.2	1.57	0.0	-1.1
2100	53.1	13.7	1.60	53.2	1.62	-0.1	-0.7
2150	53.0	13.8	1.65	53.1	1.66	-0.2	-0.9
2200	52.8	13.9	1.70	53.0	1.71	-0.4	-0.5
2250	52.7	14.0	1.76	53.0	1.76	-0.4	0.0
2300	52.6	14.2	1.82	52.9	1.81	-0.6	0.7
2350	52.4	14.4	1.88	52.8	1.85	-0.7	1.3
2400	52.3	14.5	1.94	52.8	1.90	-0.9	2.0
2450	52.2	14.7	2.00	52.7	1.95	-1.0	2.4
2500	52.0	14.8	2.05	52.6	2.02	-1.1	1.6
2550	52.0	14.8	2.10	52.6	2.09	-1.1	0.3
2600	51.8	15.0	2.17	52.5	2.16	-1.4	0.1
2650	51.6	15.1	2.23	52.4	2.23	-1.6	-0.3
2700	51.5	15.2	2.29	52.4	2.30	-1.8	-0.8
2750	51.2	15.3	2.34	52.3	2.38	-2.1	-1.5
2800	51.1	15.4	2.40	52.3	2.45	-2.2	-1.7
2850	50.9	15.6	2.47	52.2	2.52	-2.4	-2.0
2900	50.8	15.7	2.53	52.1	2.59	-2.5	-2.2
2950	50.7	15.8	2.59	52.1	2.66	-2.7	-2.8
3000	50.5	15.9	2.65	52.0	2.73	-2.8	-3.0
3050	50.4	16.0	2.71	51.9	2.79	-3.0	-2.9
3100	50.2	16.1	2.78	51.9	2.85	-3.2	-2.4
3150	50.1	16.2	2.85	51.8	2.91	-3.3	-2.0
3200	49.9	16.3	2.90	51.7	2.96	-3.6	-2.1
3250	49.8	16.5	2.98	51.7	3.02	-3.6	-1.5
3300	49.6	16.5	3.02	51.6	3.08	-3.8	-1.8
3350	49.5	16.6	3.09	51.5	3.14	-3.9	-1.5
3400	49.4	16.6	3.15	51.5	3.20	-4.0	-1.5
3450	49.2	16.7	3.21	51.4	3.26	-4.2	-1.4
3500	49.1	16.8	3.28	51.3	3.31	-4.3	-1.0
3550	48.9	16.9	3.34	51.3	3.37	-4.5	-0.9
3600	48.8	17.1	3.42	51.2	3.43	-4.6	-0.4
3650	48.7	17.1	3.47	51.1	3.49	-4.8	-0.5
3700	48.5	17.2	3.55	51.1	3.55	-4.9	0.0
3750	48.4	17.3	3.61	51.0	3.61	-5.0	0.0
3800	48.3	17.4	3.67	50.9	3.66	-5.1	0.1
3850	48.2	17.5	3.74	50.8	3.72	-5.2	0.5





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Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
info@speag.com, http://www.speag.com

Measurement Certificate / Material Test

Item Name	**Body Tissue Simulating Liquid (MBBL3500-5800V5)**
Product No.	SL AAM 501 EA (Charge: 140114-1)
Manufacturer	SPEAG

Measurement Method

TSL dielectric parameters measured using calibrated OCP probe.

Setup Validation

Validation results were within ± 2.5% towards the target values of Methanol.

Target Parameters

Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

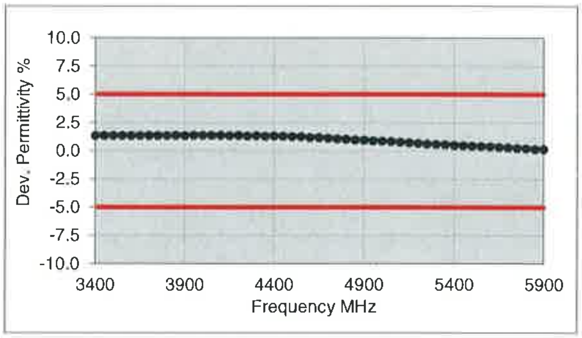
Test Condition

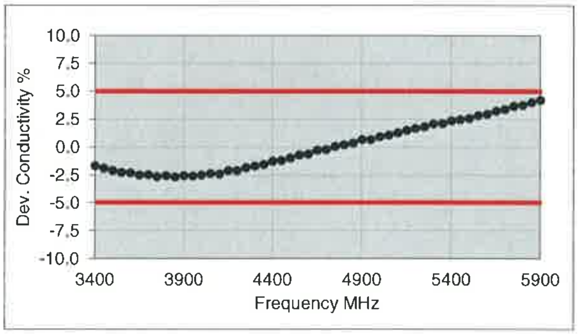
Ambient	Environment temperatur (22 ± 3)°C and humidity < 70%.
TSL Temperature	22°C
Test Date	15-Jan-14
Operator	IEN

Additional Information

TSL Density	0.996 g/cm3
TSL Heat-capacity	3.765 kJ/(kg*K)

	Measured			Target		Diff.to Target [%]	
f [MHz]	**HP-e'**	**HP-e"**	**sigma**	eps	sigma	**Δ-eps**	**Δ-sigma**
3400	52.2	16.63	3.14	51.5	3.20	1.4	-1.8
3500	**52.0**	**16.67**	**3.25**	**51.3**	**3.31**	**1.3**	**-1.9**
3600	51.9	16.74	3.35	51.2	3.43	1.4	-2.4
3700	**51.7**	**16.81**	**3.46**	**51.1**	**3.55**	**1.3**	**-2.5**
3800	51.6	16.90	3.57	50.9	3.66	1.3	-2.6
3900	51.5	16.99	3.69	50.8	3.78	1.4	-2.4
4000	51.3	17.08	3.80	50.6	3.90	1.3	-2.5
4100	51.2	17.18	3.92	50.5	4.01	1.4	-2.4
4200	51.1	17.32	4.05	50.4	4.13	1.4	-2.0
4300	50.9	17.47	4.18	50.2	4.25	1.3	-1.6
4400	50.8	17.61	4.31	50.1	4.37	1.4	-1.3
4500	50.6	17.73	4.44	50.0	4.48	1.3	-0.9
4600	50.4	17.86	4.57	49.8	4.60	1.1	-0.6
4700	50.3	18.00	4.71	49.7	4.72	1.2	-0.1
4800	50.1	18.14	4.84	49.6	4.83	1.1	0.2
4850	50.0	18.20	4.91	49.5	4.89	1.0	0.4
4900	49.9	18.28	4.98	49.4	4.95	1.0	0.6
4950	49.8	18.31	5.04	49.4	5.01	0.9	0.7
5000	49.7	18.38	5.11	49.3	5.07	0.8	0.9
5050	49.6	18.44	5.18	49.2	5.12	0.8	1.1
5100	49.5	18.50	5.25	49.2	5.18	0.7	1.3
5150	49.4	18.57	5.32	49.1	5.24	0.6	1.5
5200	**49.4**	**18.63**	**5.39**	**49.0**	**5.30**	**0.8**	**1.7**
5250	49.3	18.68	5.46	48.9	5.36	0.7	1.9
5300	49.2	18.75	5.53	48.9	5.42	0.7	2.1
5350	49.1	18.79	5.59	48.8	5.47	0.6	2.1
5400	49.0	18.86	5.66	48.7	5.53	0.5	2.3
5450	48.9	18.90	5.73	48.7	5.59	0.5	2.5
5500	**48.8**	**18.94**	**5.80**	**48.6**	**5.65**	**0.4**	**2.7**
5550	48.7	19.01	5.87	48.5	5.71	0.3	2.8
5600	48.7	19.06	5.94	48.5	5.77	0.5	3.0
5650	48.6	19.13	6.01	48.4	5.82	0.4	3.2
5700	48.5	19.18	6.08	48.3	5.88	0.3	3.3
5750	48.4	19.26	6.16	48.3	5.94	0.3	3.7
5800	**48.3**	**19.30**	**6.23**	**48.2**	**6.00**	**0.2**	**3.8**
5850	48.2	19.37	6.30	48.1	6.06	0.1	4.0
5900	48.1	19.43	6.38	48.1	6.12	0.1	4.3





Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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Accreditation No.: SCS 108

Client **UL CCS USA**

Certificate No: EX3-3902_May14

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3902
Calibration procedure(s)	QA CAL-01.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6 Calibration procedure for dosimetric E-field probes
Calibration date:	May 19, 2014

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	03-Apr-14 (No. 217-01911)	Apr-15
Power sensor E4412A	MY41498087	03-Apr-14 (No. 217-01911)	Apr-15
Reference 3 dB Attenuator	SN: S5054 (3c)	03-Apr-14 (No. 217-01915)	Apr-15
Reference 20 dB Attenuator	SN: S5277 (20x)	03-Apr-14 (No. 217-01919)	Apr-15
Reference 30 dB Attenuator	SN: S5129 (30b)	03-Apr-14 (No. 217-01920)	Apr-15
Reference Probe ES3DV2	SN: 3013	30-Dec-13 (No. ES3-3013_Dec13)	Dec-14
DAE4	SN: 660	13-Dec-13 (No. DAE4-660_Dec13)	Dec-14
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-16
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: May 20, 2014

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z: A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

Probe EX3DV4

SN:3902

Manufactured:	September 4, 2012
Calibrated:	May 19, 2014

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3902

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.45	0.46	0.46	± 10.1 %
DCP (mV)[B]	101.3	100.1	97.9	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	132.5	±2.5 %
		Y	0.0	0.0	1.0		142.7	
		Z	0.0	0.0	1.0		139.7	

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3902

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	41.9	0.89	10.36	10.36	10.36	0.47	0.76	± 12.0 %
835	41.5	0.90	10.04	10.04	10.04	0.18	1.45	± 12.0 %
900	41.5	0.97	9.91	9.91	9.91	0.40	0.84	± 12.0 %
1640	40.3	1.29	8.59	8.59	8.59	0.44	0.84	± 12.0 %
1750	40.1	1.37	8.46	8.46	8.46	0.48	0.78	± 12.0 %
1900	40.0	1.40	8.19	8.19	8.19	0.45	0.77	± 12.0 %
1950	40.0	1.40	7.91	7.91	7.91	0.49	0.75	± 12.0 %
2000	40.0	1.40	8.16	8.16	8.16	0.36	0.90	± 12.0 %
2300	39.5	1.67	7.75	7.75	7.75	0.39	0.75	± 12.0 %
2450	39.2	1.80	7.29	7.29	7.29	0.34	0.90	± 12.0 %
2600	39.0	1.96	7.06	7.06	7.06	0.36	0.89	± 12.0 %
5200	36.0	4.66	5.30	5.30	5.30	0.35	1.80	± 13.1 %
5300	35.9	4.76	5.12	5.12	5.12	0.35	1.80	± 13.1 %
5500	35.6	4.96	5.00	5.00	5.00	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.78	4.78	4.78	0.40	1.80	± 13.1 %
5800	35.3	5.27	4.75	4.75	4.75	0.40	1.80	± 13.1 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. Above 5 GHz frequency validity can be extended to ± 110 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3902

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	55.5	0.96	9.90	9.90	9.90	0.46	0.79	± 12.0 %
835	55.2	0.97	9.86	9.86	9.86	0.39	0.86	± 12.0 %
900	55.0	1.05	9.65	9.65	9.65	0.40	0.86	± 12.0 %
1640	53.8	1.40	8.67	8.67	8.67	0.59	0.69	± 12.0 %
1750	53.4	1.49	8.06	8.06	8.06	0.73	0.62	± 12.0 %
1900	53.3	1.52	7.80	7.80	7.80	0.33	0.93	± 12.0 %
1950	53.3	1.52	8.05	8.05	8.05	0.27	1.05	± 12.0 %
2000	53.3	1.52	7.94	7.94	7.94	0.38	0.87	± 12.0 %
2300	52.9	1.81	7.55	7.55	7.55	0.72	0.59	± 12.0 %
2450	52.7	1.95	7.35	7.35	7.35	0.80	0.58	± 12.0 %
2600	52.5	2.16	7.18	7.18	7.18	0.80	0.50	± 12.0 %
5200	49.0	5.30	4.49	4.49	4.49	0.45	1.90	± 13.1 %
5300	48.9	5.42	4.33	4.33	4.33	0.45	1.90	± 13.1 %
5500	48.6	5.65	3.93	3.93	3.93	0.50	1.90	± 13.1 %
5600	48.5	5.77	3.73	3.73	3.73	0.50	1.90	± 13.1 %
5800	48.2	6.00	4.11	4.11	4.11	0.50	1.90	± 13.1 %

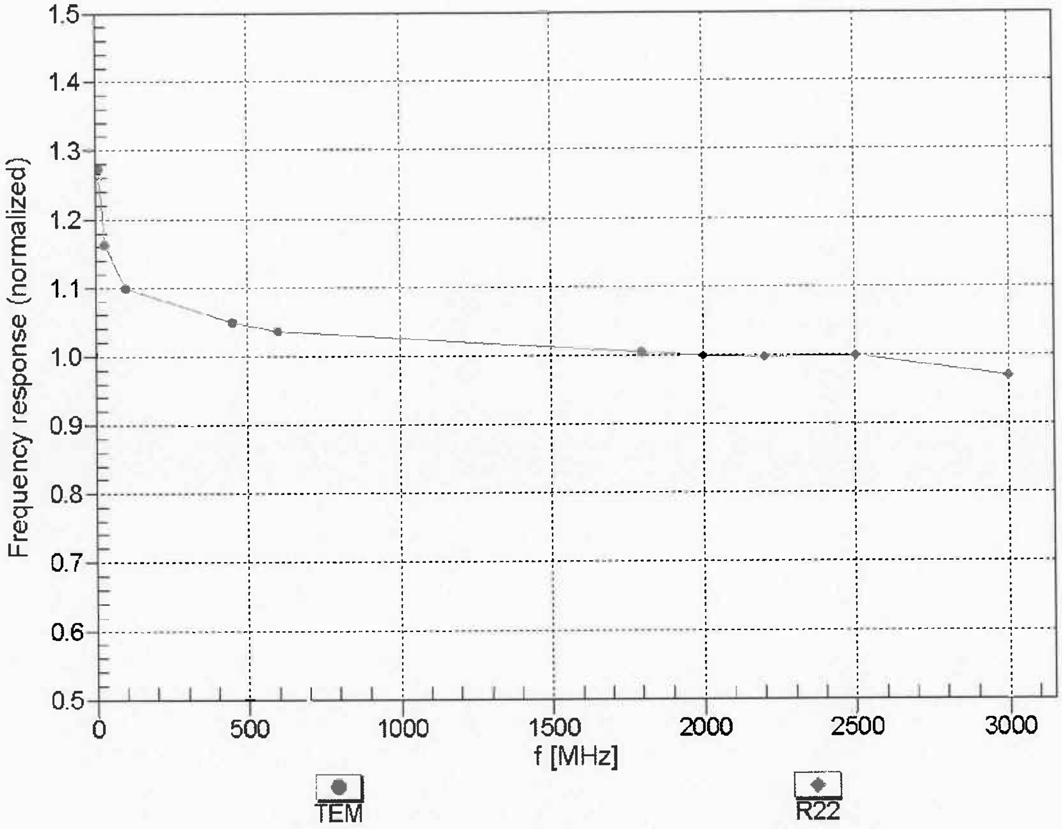
[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. Above 5 GHz frequency validity can be extended to ± 110 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

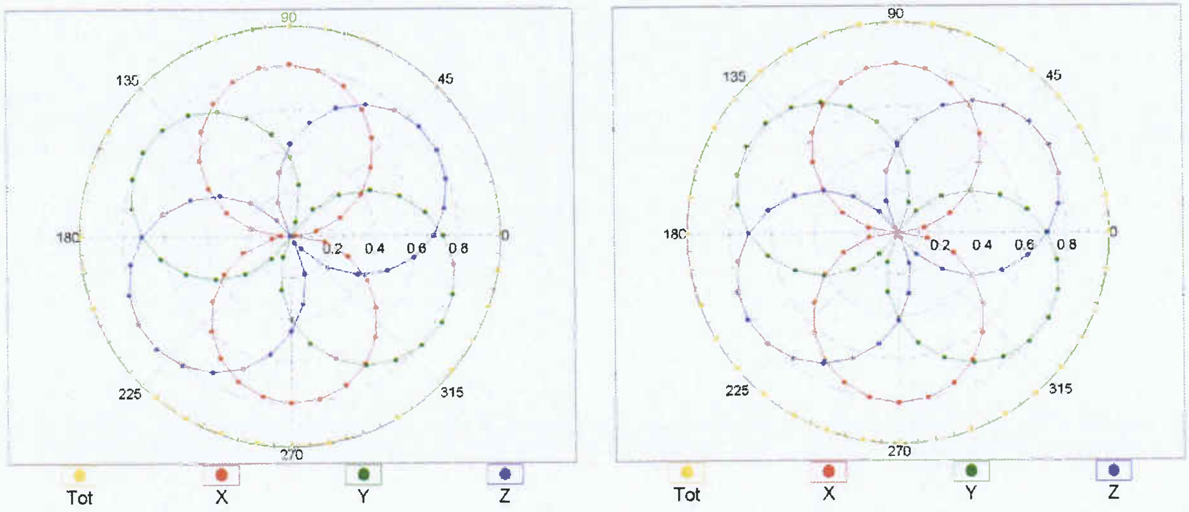
Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide: R22)

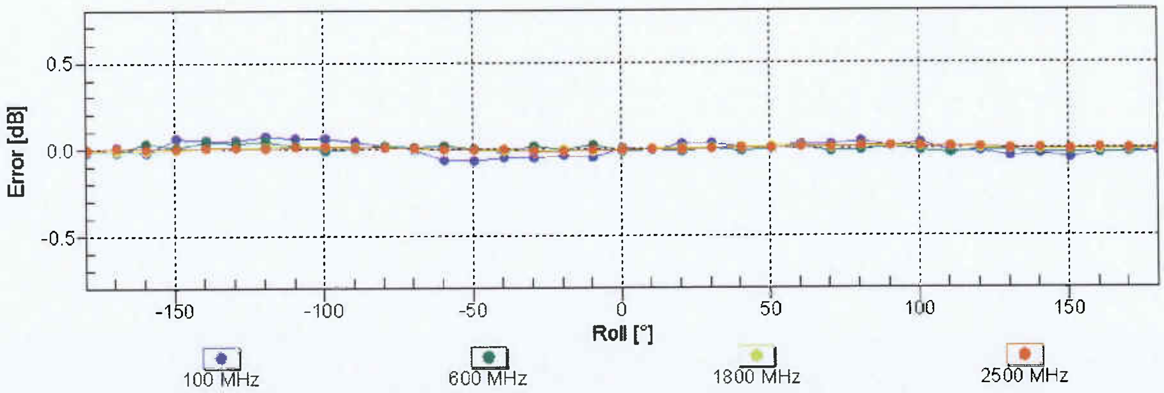


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), $\vartheta = 0°$


f=600 MHz,TEM

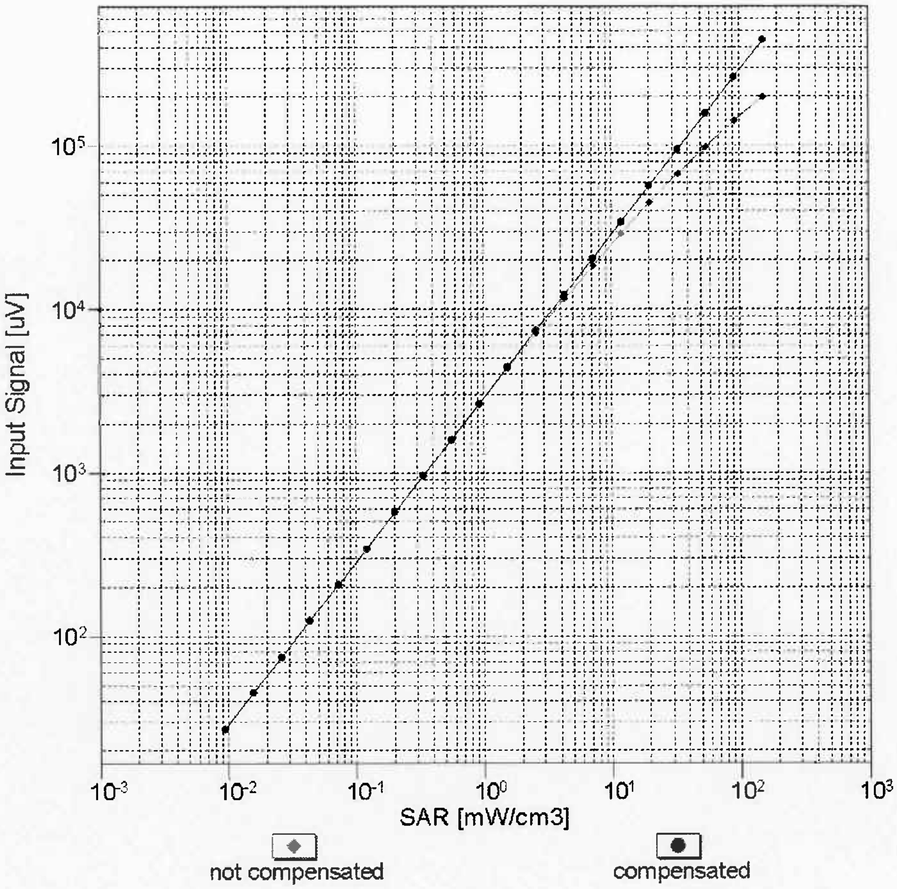
f=1800 MHz,R22

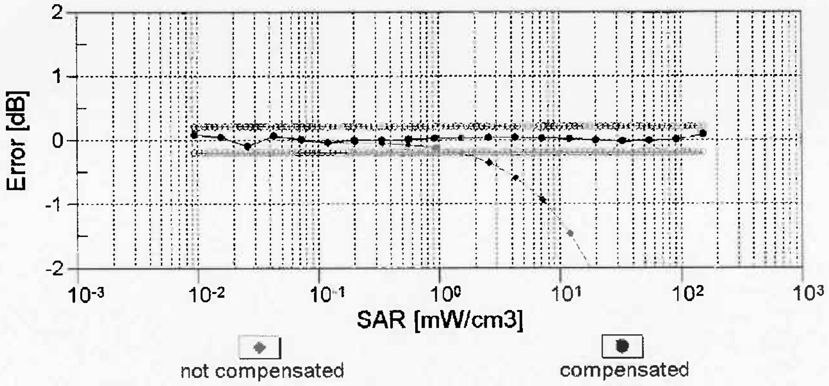


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR$_{head}$)

(TEM cell , f$_{eval}$= 1900 MHz)

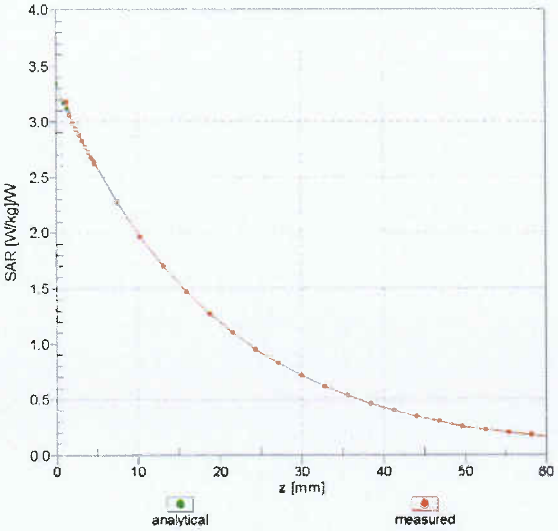




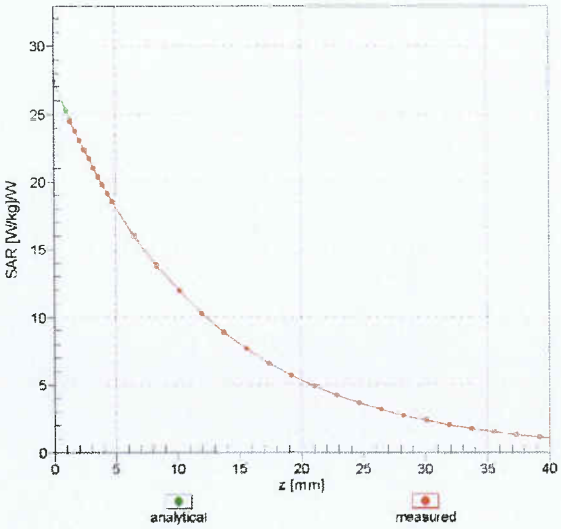
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

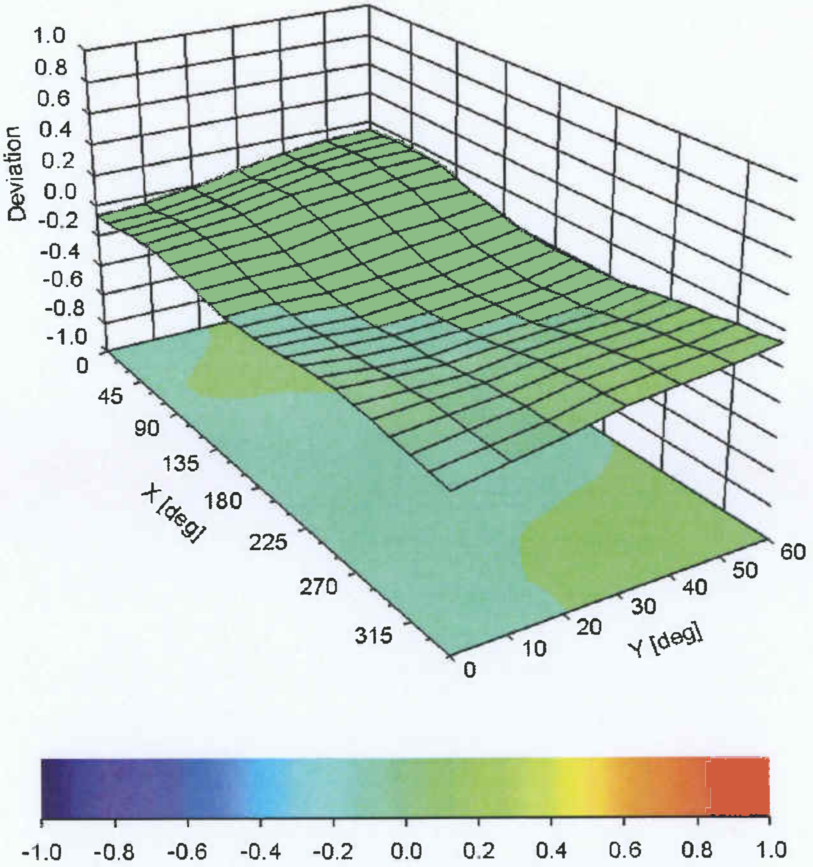


f = 1900 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3902

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	0.6
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 mm

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client **UL CCS USA**

Certificate No: EX3-3991_Ma14

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3991
Calibration procedure(s)	QA CAL-01.v9, QA CAL-12.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6 Calibration procedure for dosimetric E-field probes
Calibration date:	May 16, 2014

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	03-Apr-14 (No. 217-01911)	Apr-15
Power sensor E4412A	MY41498087	03-Apr-14 (No. 217-01911)	Apr-15
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Reference 20 dB Attenuator	SN: S5277 (20x)	03-Apr-14 (No. 217-01919)	Apr-15
Reference 30 dB Attenuator	SN: S5129 (30b)	03-Apr-14 (No. 217-01920)	Apr-15
Reference Probe ES3DV2	SN: 3013	30-Dec-13 (No. ES3-3013_Dec13)	Dec-14
DAE4	SN: 660	13-Dec-13 (No. DAE4-660_Dec13)	Dec-14
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-16
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: May 17, 2014

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, “IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”, June 2013

b) IEC 62209-1, “Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z: A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

Probe EX3DV4

SN:3991

Manufactured: January 21, 2014
Calibrated: May 16, 2014

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3991

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.48	0.51	0.60	± 10.1 %
DCP (mV)[B]	99.9	101.6	99.2	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B $dB\sqrt{\mu V}$	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	140.3	±2.7 %
		Y	0.0	0.0	1.0		138.9	
		Z	0.0	0.0	1.0		131.6	

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3991

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
450	43.5	0.87	11.75	11.75	11.75	0.18	1.20	± 13.3 %
750	41.9	0.89	10.46	10.46	10.46	0.50	0.69	± 12.0 %
835	41.5	0.90	9.94	9.94	9.94	0.20	1.20	± 12.0 %
900	41.5	0.97	9.78	9.78	9.78	0.52	0.68	± 12.0 %
1450	40.5	1.20	8.80	8.80	8.80	0.37	1.00	± 12.0 %
1640	40.3	1.29	8.22	8.22	8.22	0.57	0.68	± 12.0 %
1750	40.1	1.37	8.83	8.83	8.83	0.43	0.85	± 12.0 %
1900	40.0	1.40	8.55	8.55	8.55	0.66	0.67	± 12.0 %
1950	40.0	1.40	8.11	8.11	8.11	0.30	1.00	± 12.0 %
2000	40.0	1.40	8.29	8.29	8.29	0.50	0.77	± 12.0 %
2300	39.5	1.67	7.88	7.88	7.88	0.32	0.98	± 12.0 %
2450	39.2	1.80	7.45	7.45	7.45	0.32	0.97	± 12.0 %
2600	39.0	1.96	7.21	7.21	7.21	0.36	0.93	± 12.0 %
3500	37.9	2.91	6.97	6.97	6.97	0.39	1.04	± 13.1 %
3700	37.7	3.12	6.90	6.90	6.90	0.53	0.88	± 13.1 %
4950	36.3	4.40	5.42	5.42	5.42	0.30	1.80	± 13.1 %
5200	36.0	4.66	5.23	5.23	5.23	0.35	1.80	± 13.1 %
5300	35.9	4.76	4.96	4.96	4.96	0.35	1.80	± 13.1 %
5500	35.6	4.96	4.93	4.93	4.93	0.35	1.80	± 13.1 %
5600	35.5	5.07	4.73	4.73	4.73	0.40	1.80	± 13.1 %
5800	35.3	5.27	4.66	4.66	4.66	0.45	1.80	± 13.1 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Above 5 GHz frequency validity can be extended to ± 110 MHz. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3991

Calibration Parameter Determined in Body Tissue Simulating Media

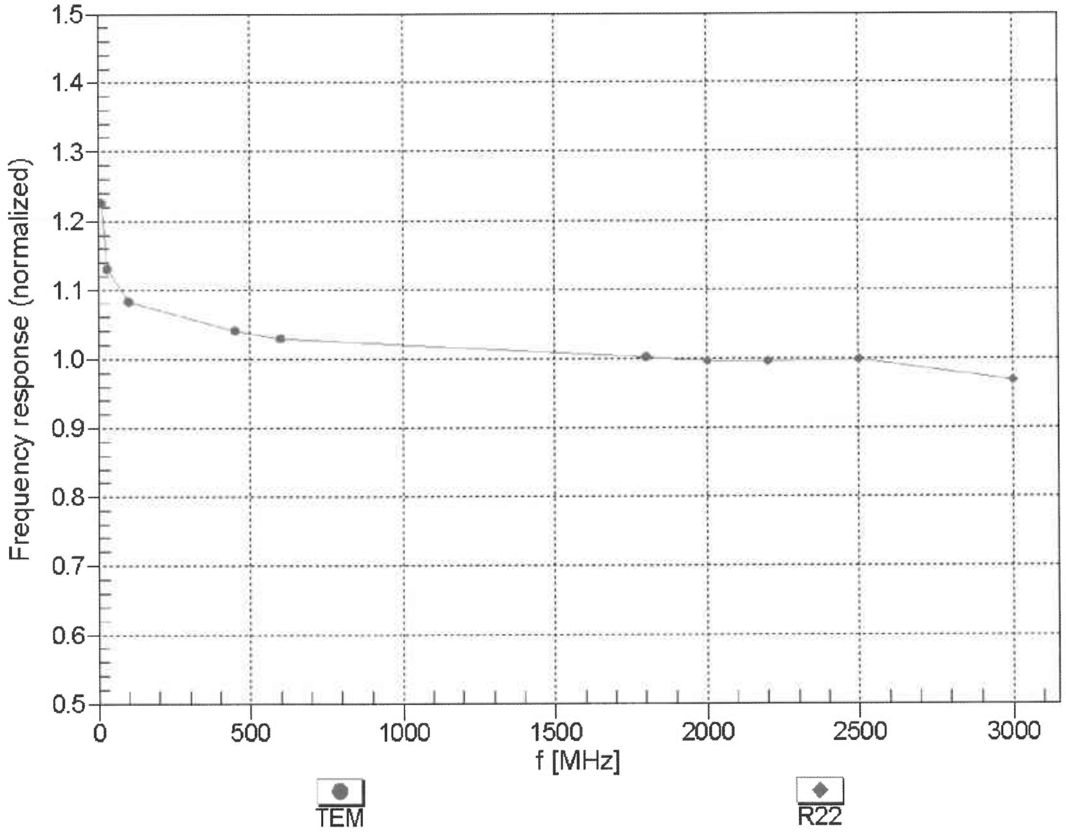
f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
450	56.7	0.94	11.38	11.38	11.38	0.10	1.20	± 13.3 %
750	55.5	0.96	9.85	9.85	9.85	0.20	1.38	± 12.0 %
835	55.2	0.97	9.70	9.70	9.70	0.28	1.10	± 12.0 %
900	55.0	1.05	9.49	9.49	9.49	0.65	0.73	± 12.0 %
1450	54.0	1.30	8.33	8.33	8.33	0.31	1.02	± 12.0 %
1640	53.8	1.40	8.28	8.28	8.28	0.52	0.76	± 12.0 %
1750	53.4	1.49	8.08	8.08	8.08	0.51	0.86	± 12.0 %
1900	53.3	1.52	7.65	7.65	7.65	0.35	0.97	± 12.0 %
1950	53.3	1.52	7.88	7.88	7.88	0.34	0.87	± 12.0 %
2000	53.3	1.52	7.76	7.76	7.76	0.44	0.75	± 12.0 %
2300	52.9	1.81	7.45	7.45	7.45	0.61	0.68	± 12.0 %
2450	52.7	1.95	7.23	7.23	7.23	0.71	0.59	± 12.0 %
2600	52.5	2.16	6.98	6.98	6.98	0.80	0.50	± 12.0 %
3500	51.3	3.31	6.83	6.83	6.83	0.39	1.10	± 13.1 %
3700	51.0	3.55	6.77	6.77	6.77	0.32	1.20	± 13.1 %
4950	49.4	5.01	4.79	4.79	4.79	0.35	1.90	± 13.1 %
5200	49.0	5.30	4.66	4.66	4.66	0.40	1.90	± 13.1 %
5300	48.9	5.42	4.47	4.47	4.47	0.40	1.90	± 13.1 %
5500	48.6	5.65	4.13	4.13	4.13	0.45	1.90	± 13.1 %
5600	48.5	5.77	4.41	4.41	4.41	0.25	1.90	± 13.1 %
5800	48.2	6.00	4.32	4.32	4.32	0.45	1.90	± 13.1 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Above 5 GHz frequency validity can be extended to ± 110 MHz. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

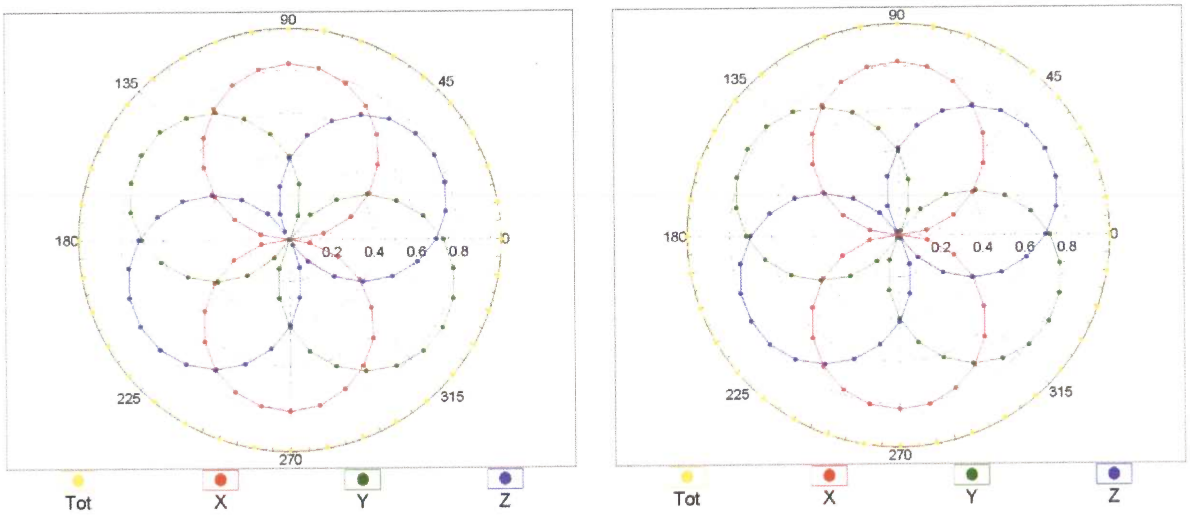
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



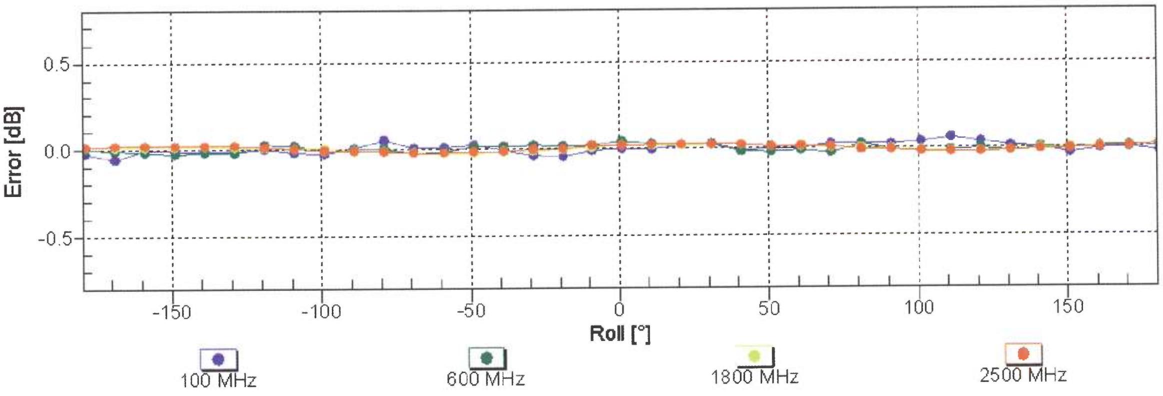
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), ϑ = 0°



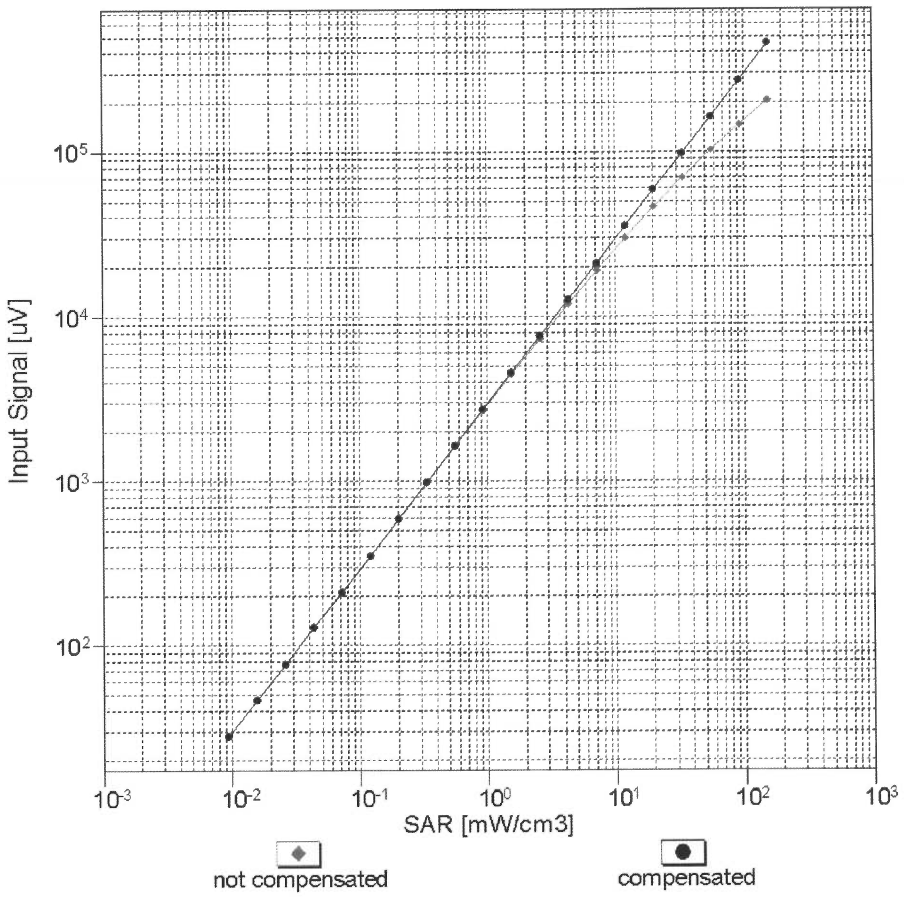
f=600 MHz,TEM

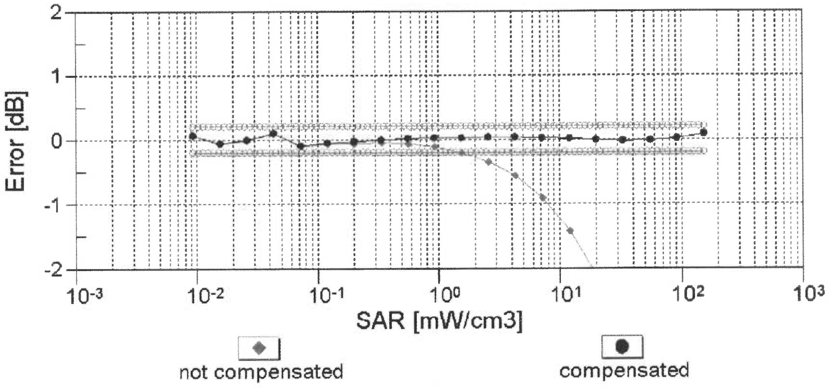
f=1800 MHz,R22



Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

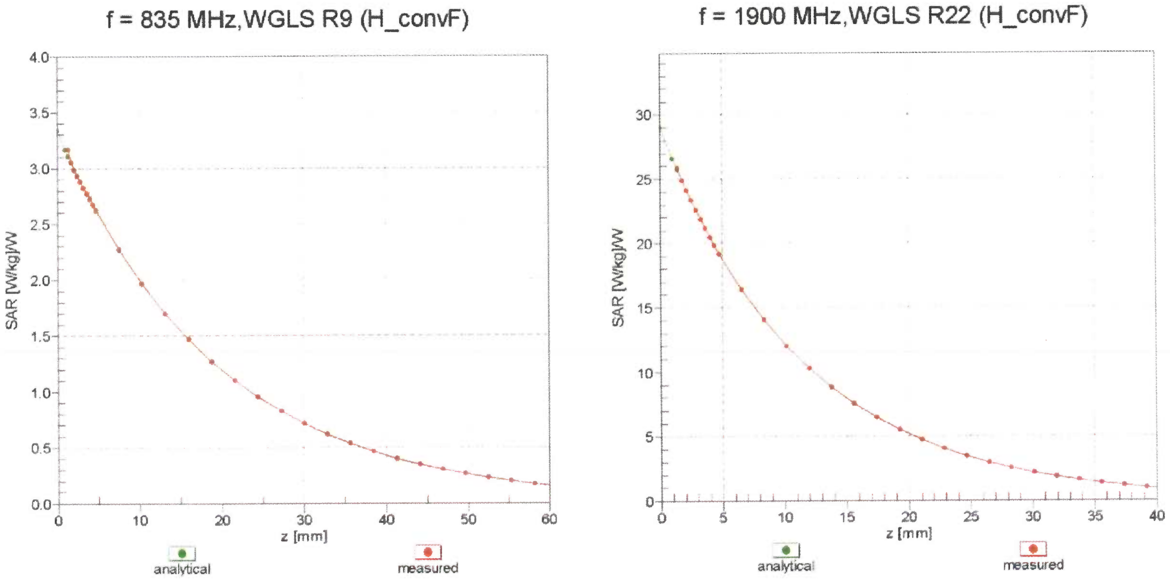
Dynamic Range f(SAR_{head})
(TEM cell , f_{eval}= 1900 MHz)





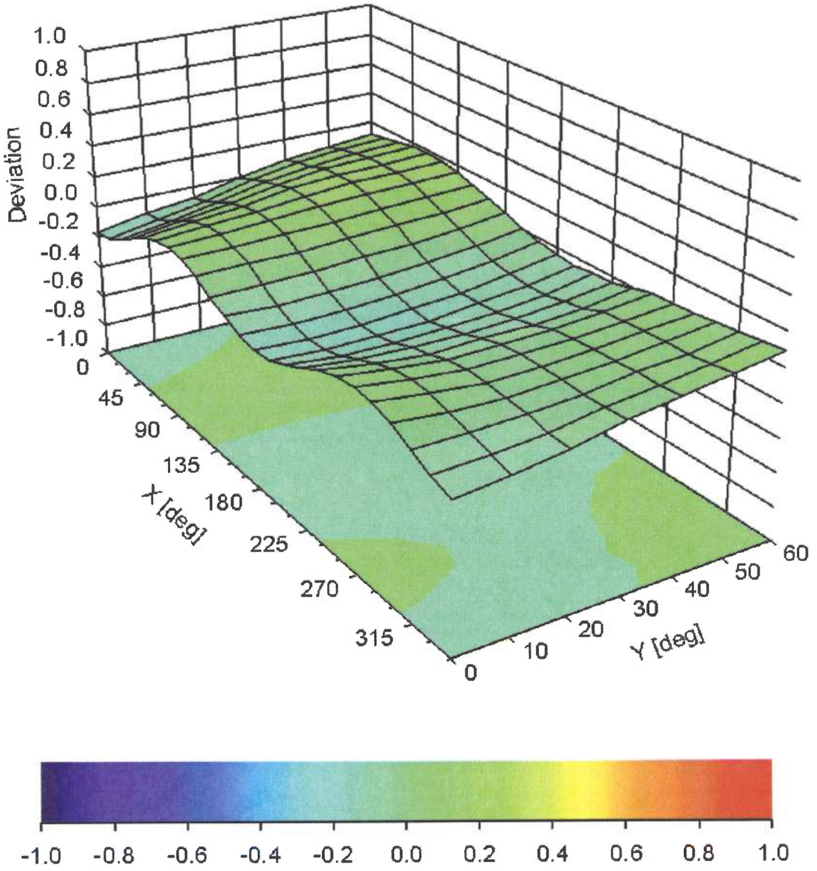
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3991

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	1
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 mm

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client **UL CCS USA**

Certificate No: D2450V2-748_Feb14

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 748
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	February 18, 2014

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ES3DV3	SN: 3205	30-Dec-13 (No. ES3-3205_Dec13)	Dec-14
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

	Name	Function	Signature
Calibrated by:	Israe El-Naouq	Laboratory Technician	Israe El-Naouq
Approved by:	Katja Pokovic	Technical Manager	

Issued: February 18, 2014

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, “IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”, June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) KDB 865664, “SAR Measurement Requirements for 100 MHz to 6 GHz”

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.1 ± 6 %	1.86 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.2 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**51.6 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.09 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.0 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	50.7 ± 6 %	2.02 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.0 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**50.7 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.02 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**23.7 W/kg ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.3 Ω - 1.9 jΩ
Return Loss	- 27.0 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	51.2 Ω + 0.4 jΩ
Return Loss	- 38.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.155 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	December 01, 2003

DASY5 Validation Report for Head TSL

Date: 18.02.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 748

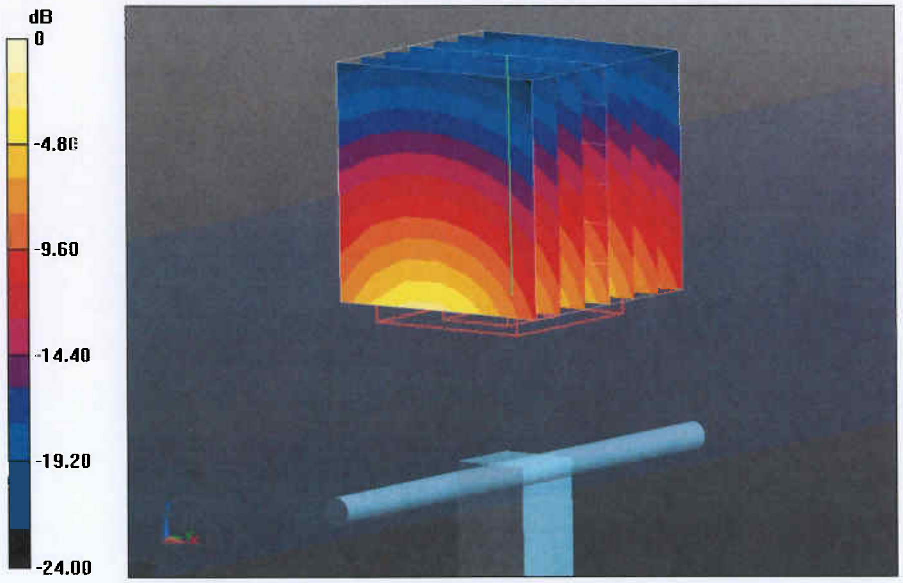
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.86 S/m; ε_r = 38.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.53, 4.53, 4.53); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

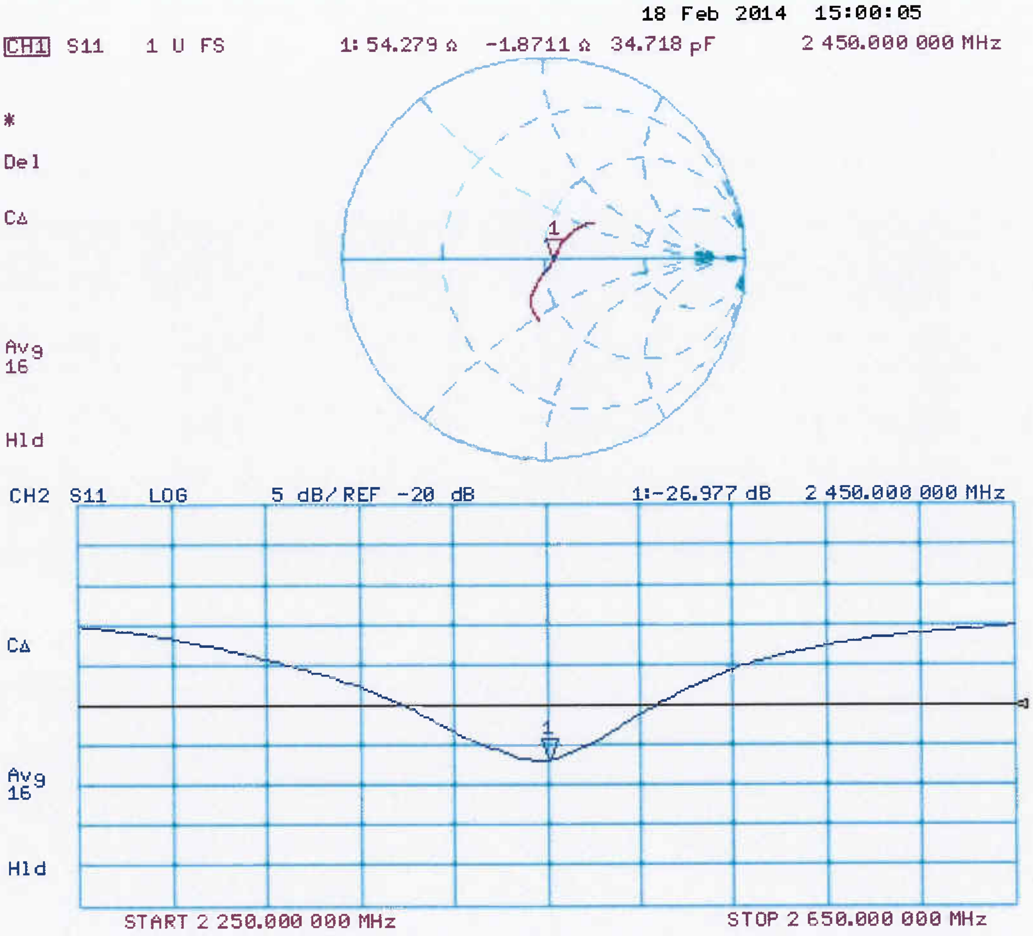
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 99.041 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 27.4 W/kg
SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.09 W/kg
Maximum value of SAR (measured) = 17.0 W/kg



0 dB = 17.0 W/kg = 12.30 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 18.02.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 748

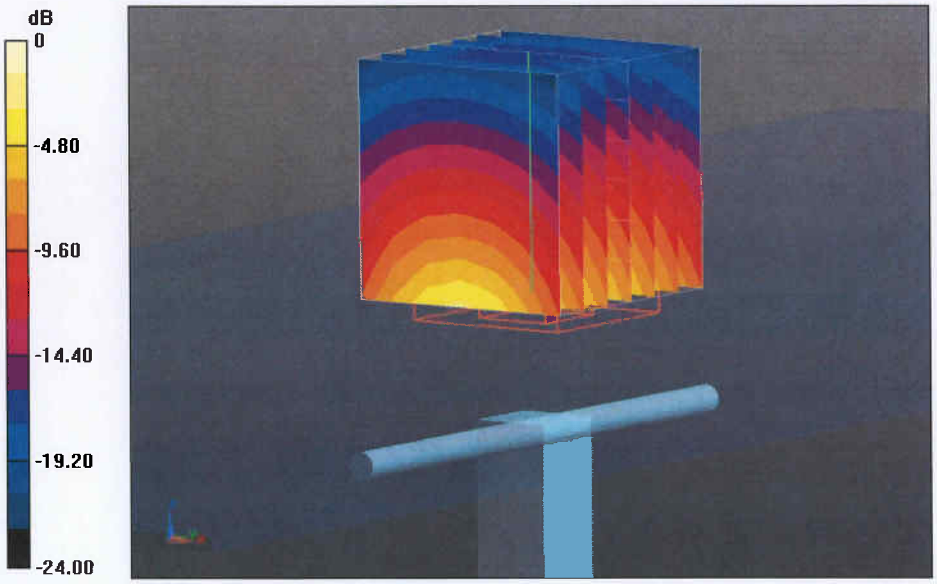
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; $\sigma = 2.02$ S/m; $\varepsilon_r = 50.7$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.35, 4.35, 4.35); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

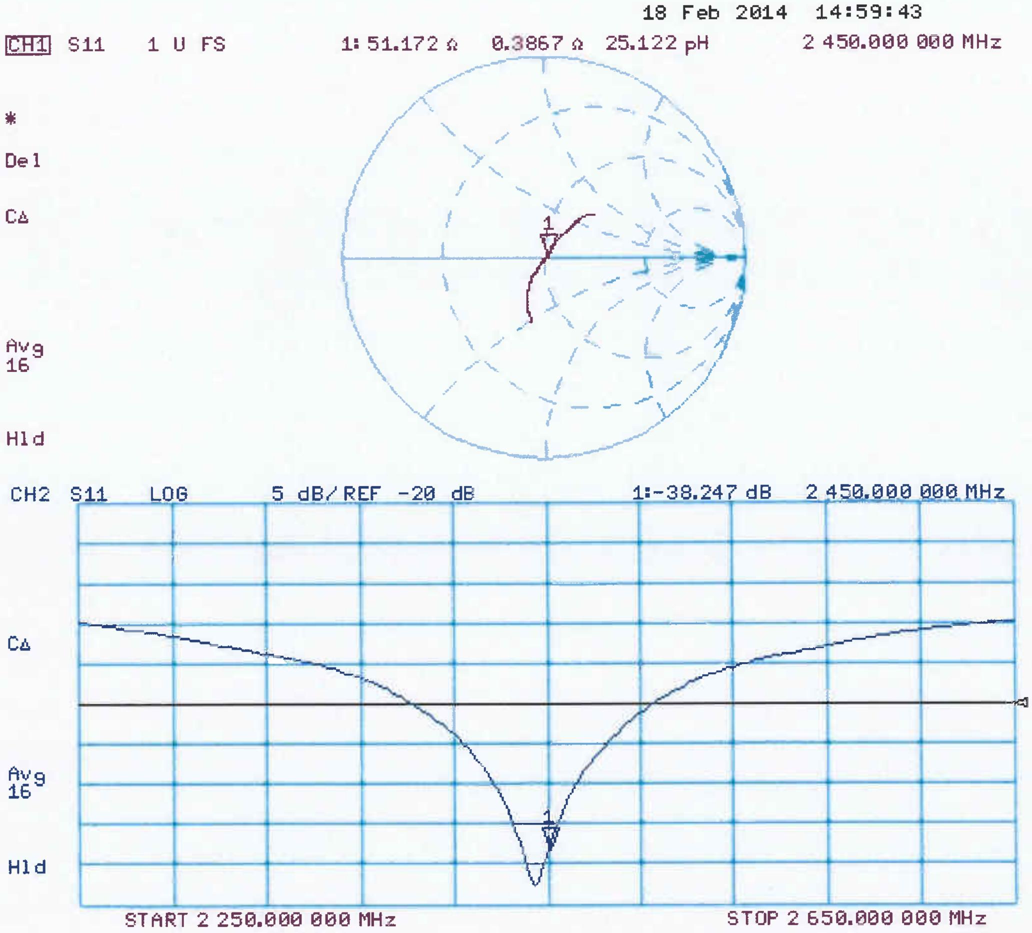
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.469 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 27.2 W/kg
SAR(1 g) = 13 W/kg; SAR(10 g) = 6.02 W/kg
Maximum value of SAR (measured) = 17.2 W/kg



0 dB = 17.2 W/kg = 12.36 dBW/kg

Impedance Measurement Plot for Body TSL



Calibration Laboratory of
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Zeughausstrasse 43, 8004 Zurich, Switzerland

S **Schweizerischer Kalibrierdienst**
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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client **UL CCS USA**

Certificate No: D5GHzV2-1003_Feb14

CALIBRATION CERTIFICATE

Object	D5GHzV2 - SN: 1003
Calibration procedure(s)	QA CAL-22.v2 Calibration procedure for dipole validation kits between 3-6 GHz
Calibration date:	February 26, 2014

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe EX3DV4	SN: 3503	30-Dec-13 (No. EX3-3503_Dec13)	Dec-14
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: February 27, 2014

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEC 62209-2, “Evaluation of Human Exposure to Radio Frequency Fields from Handheld and Body-Mounted Wireless Communication Devices in the Frequency Range of 30 MHz to 6 GHz: Human models, Instrumentation, and Procedures”; Part 2: “Procedure to determine the Specific Absorption Rate (SAR) for including accessories and multiple transmitters”, March 2010
b) KDB 865664, “SAR Measurement Requirements for 100 MHz to 6 GHz”
c) IEEE Std 1528-2013, “IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”, June 2013

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5200 MHz ± 1 MHz 5600 MHz ± 1 MHz 5800 MHz ± 1 MHz	

Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	36.0	4.66 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.1 ± 6 %	4.52 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5200 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.73 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**77.7 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.21 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.2 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	36.6 ± 6 %	4.95 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.14 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**81.8 W / kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.31 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.2 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	36.3 ± 6 %	5.16 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.79 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**78.3 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.20 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.1 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	49.0	5.30 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.8 ± 6 %	5.40 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5200 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.38 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**73.5 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.06 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.5 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.5	5.77 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.1 ± 6 %	5.94 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	8.00 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**79.6 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.22 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**22.1 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.2	6.00 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.8 ± 6 %	6.21 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5800 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.41 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**73.8 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.05 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.4 W/kg ± 19.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	49.5 Ω - 9.7 jΩ
Return Loss	- 20.3 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	55.2 Ω - 3.9 jΩ
Return Loss	- 24.2 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	57.4 Ω - 6.9 jΩ
Return Loss	- 20.5 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	48.1 Ω - 8.7 jΩ
Return Loss	- 20.9 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	54.9 Ω - 3.0 jΩ
Return Loss	- 25.3 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	57.0 Ω - 5.6 jΩ
Return Loss	- 21.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.205 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	July 08, 2003

DASY5 Validation Report for Head TSL

Date: 26.02.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1003

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; $\sigma = 4.52$ S/m; $\varepsilon_r = 37.1$; $\rho = 1000$ kg/m^3 ,
Medium parameters used: f = 5600 MHz; $\sigma = 4.95$ S/m; $\varepsilon_r = 36.6$; $\rho = 1000$ kg/m^3 ,
Medium parameters used: f = 5800 MHz; $\sigma = 5.16$ S/m; $\varepsilon_r = 36.3$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

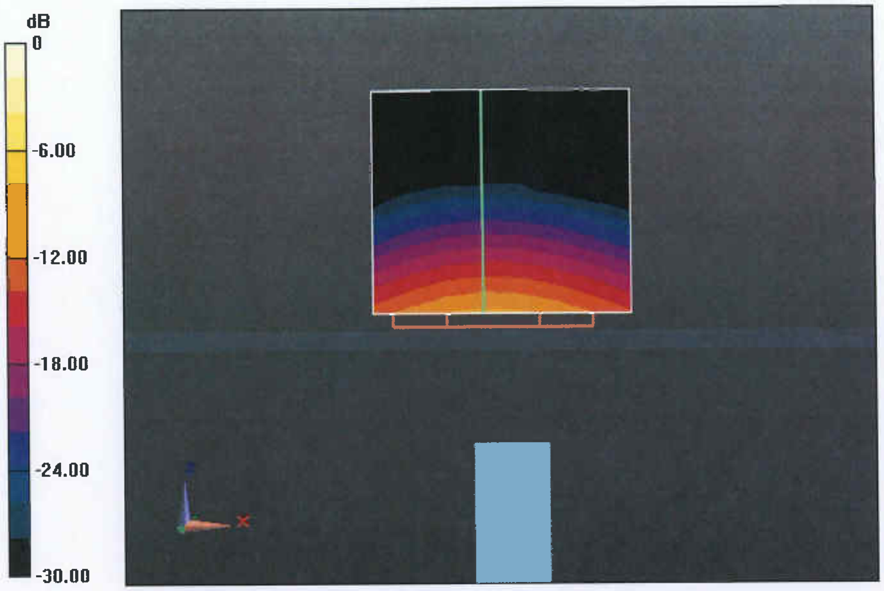
DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.52, 5.52, 5.52); Calibrated: 30.12.2013, ConvF(4.86, 4.86, 4.86); Calibrated: 30.12.2013, ConvF(4.91, 4.91, 4.91); Calibrated: 30.12.2013;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 64.500 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 28.3 W/kg
SAR(1 g) = 7.73 W/kg; SAR(10 g) = 2.21 W/kg
Maximum value of SAR (measured) = 18.0 W/kg

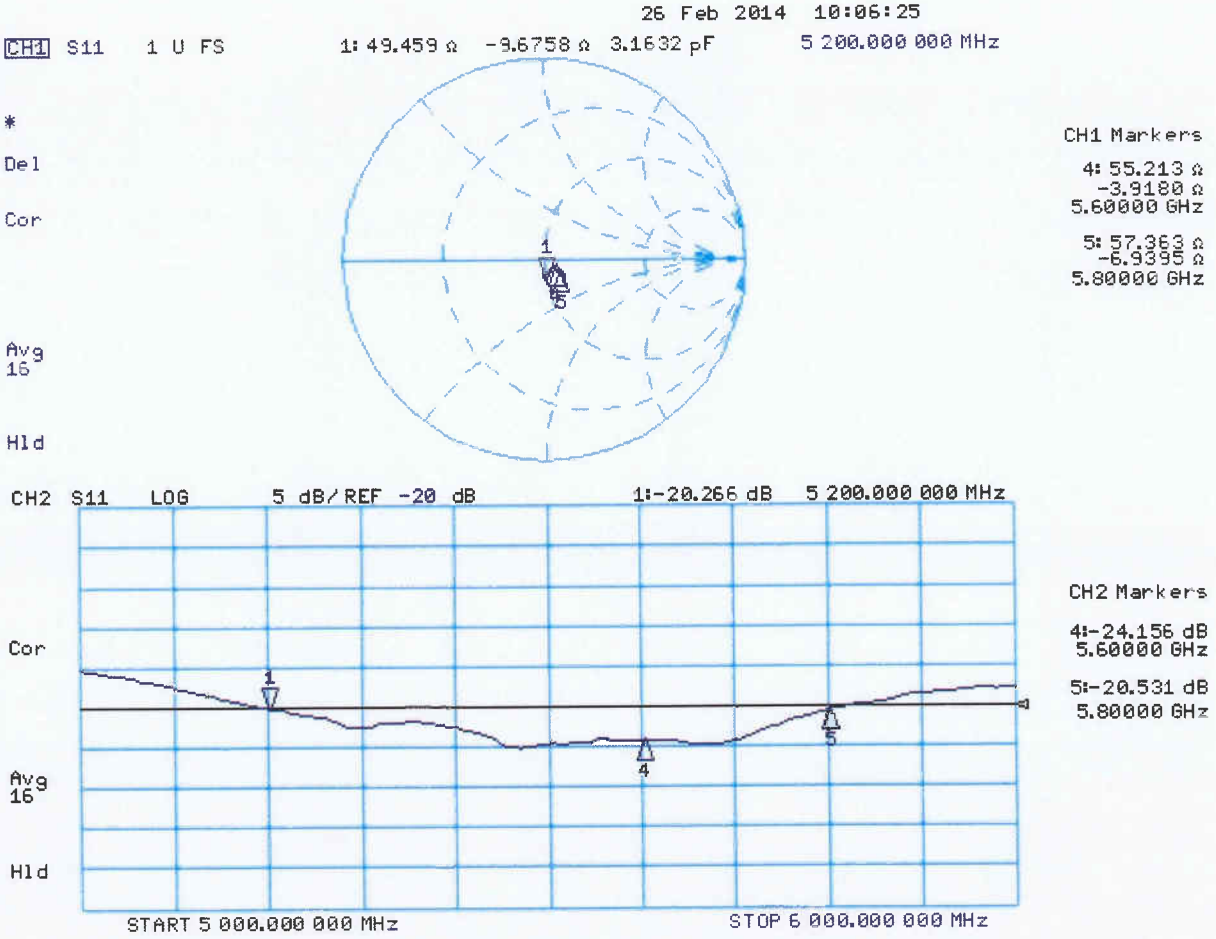
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 62.530 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 32.7 W/kg
SAR(1 g) = 8.14 W/kg; SAR(10 g) = 2.31 W/kg
Maximum value of SAR (measured) = 19.6 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 60.003 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 32.8 W/kg
SAR(1 g) = 7.79 W/kg; SAR(10 g) = 2.2 W/kg
Maximum value of SAR (measured) = 19.2 W/kg



0 dB = 19.2 W/kg = 12.83 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 25.02.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1003

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; $\sigma = 5.4$ S/m; $\varepsilon_r = 47.8$; $\rho = 1000$ kg/m^3 ,
Medium parameters used: f = 5600 MHz; $\sigma = 5.94$ S/m; $\varepsilon_r = 47.1$; $\rho = 1000$ kg/m^3 ,
Medium parameters used: f = 5800 MHz; $\sigma = 6.21$ S/m; $\varepsilon_r = 46.8$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

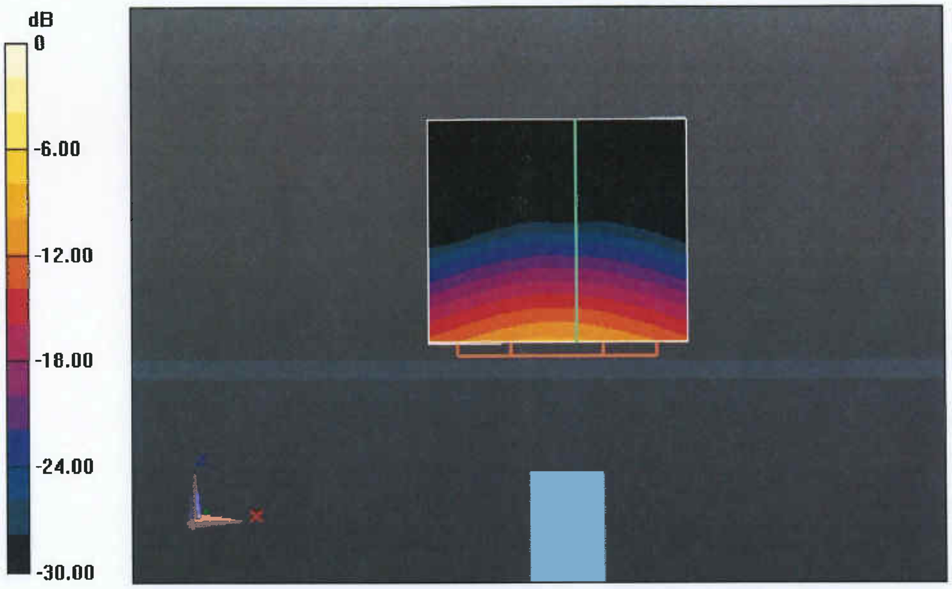
DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.01, 5.01, 5.01); Calibrated: 30.12.2013, ConvF(4.3, 4.3, 4.3); Calibrated: 30.12.2013, ConvF(4.47, 4.47, 4.47); Calibrated: 30.12.2013;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 58.255 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 29.4 W/kg
SAR(1 g) = 7.38 W/kg; SAR(10 g) = 2.06 W/kg
Maximum value of SAR (measured) = 17.1 W/kg

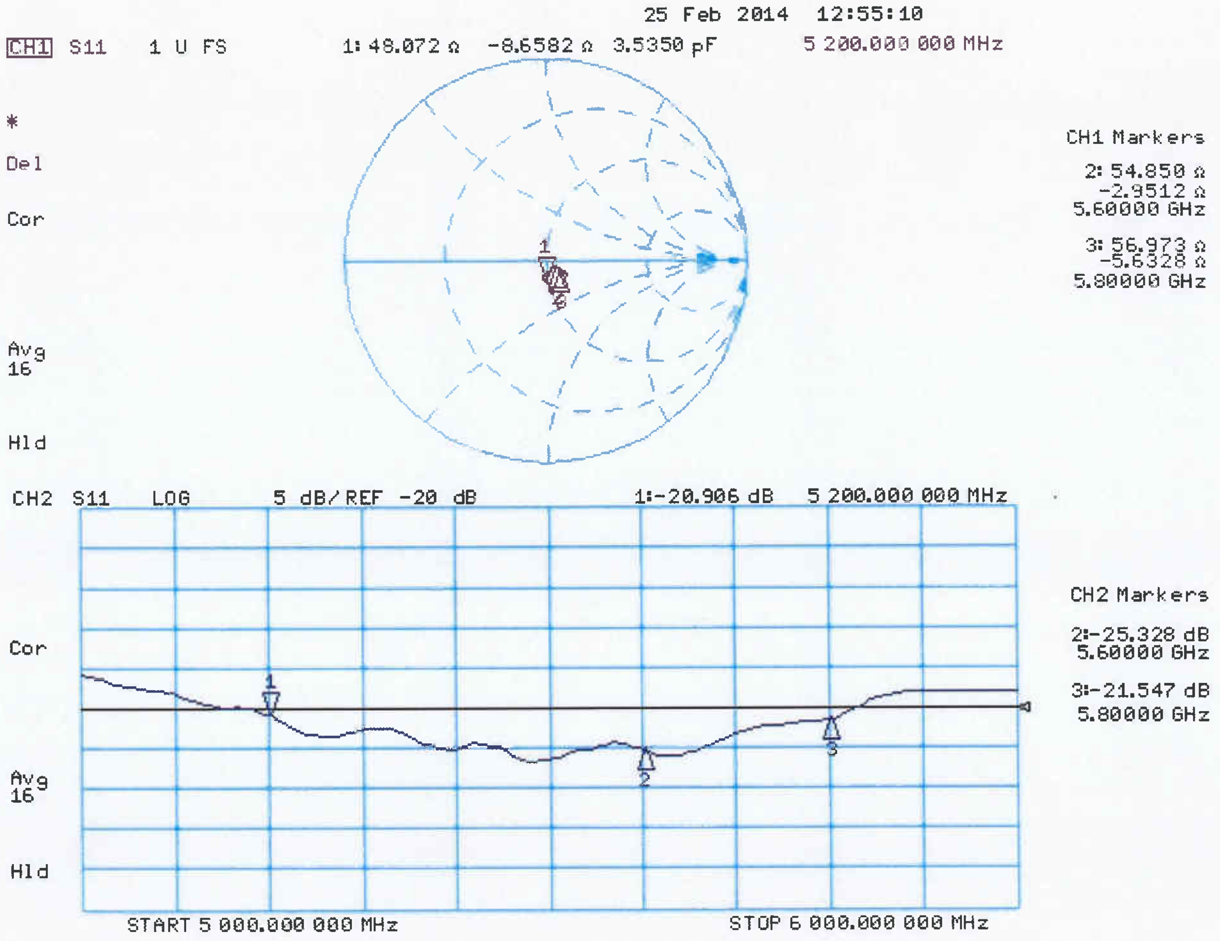
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 58.169 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 35.7 W/kg
SAR(1 g) = 8 W/kg; SAR(10 g) = 2.22 W/kg
Maximum value of SAR (measured) = 19.2 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 54.883 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 34.7 W/kg
SAR(1 g) = 7.41 W/kg; SAR(10 g) = 2.05 W/kg
Maximum value of SAR (measured) = 18.2 W/kg



0 dB = 18.2 W/kg = 12.60 dBW/kg

Impedance Measurement Plot for Body TSL



FCC CFR47 PART 15 SUBPART C

BLUETOOTH LOW ENERGY

CERTIFICATION TEST REPORT

FOR

PORTABLE GAMING DEVICE

MODEL NUMBER: P2523

FCC ID: VOB-P2523

REPORT NUMBER: 14U19497-E6V2

ISSUE DATE: JULY 12, 2016

Prepared for
NVIDIA
2701 SAN TOMAS EXPY
SANTA CLARA, CA 95050

Prepared by
UL VERIFICATION SERVICES INC.
47173 BENICIA STREET
FREMONT, CA 94538, U.S.A.
TEL: (510) 771-1000
FAX: (510) 661-0888

NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	6/20/16	Initial Issue	D. Coronia
V2	7/12/16	Updated Section 6	D. Coronia

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS 4

2. TEST METHODOLOGY 5

3. FACILITIES AND ACCREDITATION 5

4. CALIBRATION AND UNCERTAINTY 5

4.1. MEASURING INSTRUMENT CALIBRATION 5

4.2. SAMPLE CALCULATION 5

4.3. MEASUREMENT UNCERTAINTY 6

5. EQUIPMENT UNDER TEST 7

5.1. DESCRIPTION OF EUT 7

5.2. MAXIMUM OUTPUT POWER 7

5.3. DESCRIPTION OF AVAILABLE ANTENNAS 7

5.4. WORST-CASE CONFIGURATION AND MODE 7

5.5. DESCRIPTION OF TEST SETUP 8

6. TEST AND MEASUREMENT EQUIPMENT 10

8. SUMMARY 12

9. ANTENNA PORT TEST RESULTS 13

9.1. ON TIME, DUTY CYCLE 13

9.2. 6 dB BANDWIDTH 14

9.3. 99% BANDWIDTH 15

9.4. OUTPUT POWER 16

9.5. AVERAGE POWER 17

9.6. POWER SPECTRAL DENSITY 18

9.7. CONDUCTED SPURIOUS EMISSIONS 19

10. RADIATED TEST RESULTS 21

10.1. TRANSMITTER ABOVE 1 GHz 22

10.1. TRANSMITTER BELOW 1 GHz 32

11. AC POWER LINE CONDUCTED EMISSIONS 34

12. SETUP PHOTOS 37

1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	NVIDIA
EUT DESCRIPTION:	Portable Gaming Device
MODEL:	P2523
SERIAL NUMBER:	P2523-E02-S0929
DATE TESTED:	NOVEMBER 21-DECEMBER 8, 2014

APPLICABLE STANDARDS

STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Pass

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For
UL Verification Services Inc. By:

DAN CORONIA
CONSUMER TECHNOLOGY DIVISION
WiSE PROJECT LEAD
UL VERIFICATION SERVICES INC

Prepared By :

KIYA KEDIDA
CONSUMER TECHNOLOGY DIVISION
WiSE LAB ENGINEER
UL VERIFICATION SERVICES INC

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, FCC CFR 47 Part 2, FCC CFR 47 Part 15.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, Fremont, California, USA. Line conducted emissions are measured only at the 47173 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

47173 Benicia Street	47266 Benicia Street
☒ Chamber A(IC: 2324B-1)	☐ Chamber D(IC: 2324B-4)
☒ Chamber B(IC: 2324B-2)	☐ Chamber E(IC: 2324B-5)
☒ Chamber C(IC: 2324B-3)	☐ Chamber F(IC: 2324B-6)
	☐ Chamber G(IC: 2324B-7)
	☐ Chamber H(IC: 2324B-8)

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers A through H are covered under Industry Canada company address code 2324B with site numbers 2324B -1 through 2324B-8, respectively.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://ts.nist.gov/standards/scopes/2000650.htm.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 9KHz to 30 MHz	2.14 dB
Radiated Disturbance, 30 to 1000 MHz	4.98 dB
Radiated Disturbance,1000 to 6000 MHz	3.86 dB
Radiated Disturbance,6000 to 18000 MHz	4.23 dB
Radiated Disturbance,18000 to 26000 MHz	5.30 dB
Radiated Disturbance,26000 to 40000 MHz	5.23 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a Portable Gaming Device.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2402-2480	BLE	6.22	4.19

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antenna, with a maximum gain of 3.36 dBi.

5.4. WORST-CASE CONFIGURATION AND MODE

Radiated emission and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

The fundamental of the EUT was investigated in three orthogonal orientations X, Y, Z it was determined that Y orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Y orientation.

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
AC Adapter	NVIDIA	SPA011AU5W	R43001	N/A

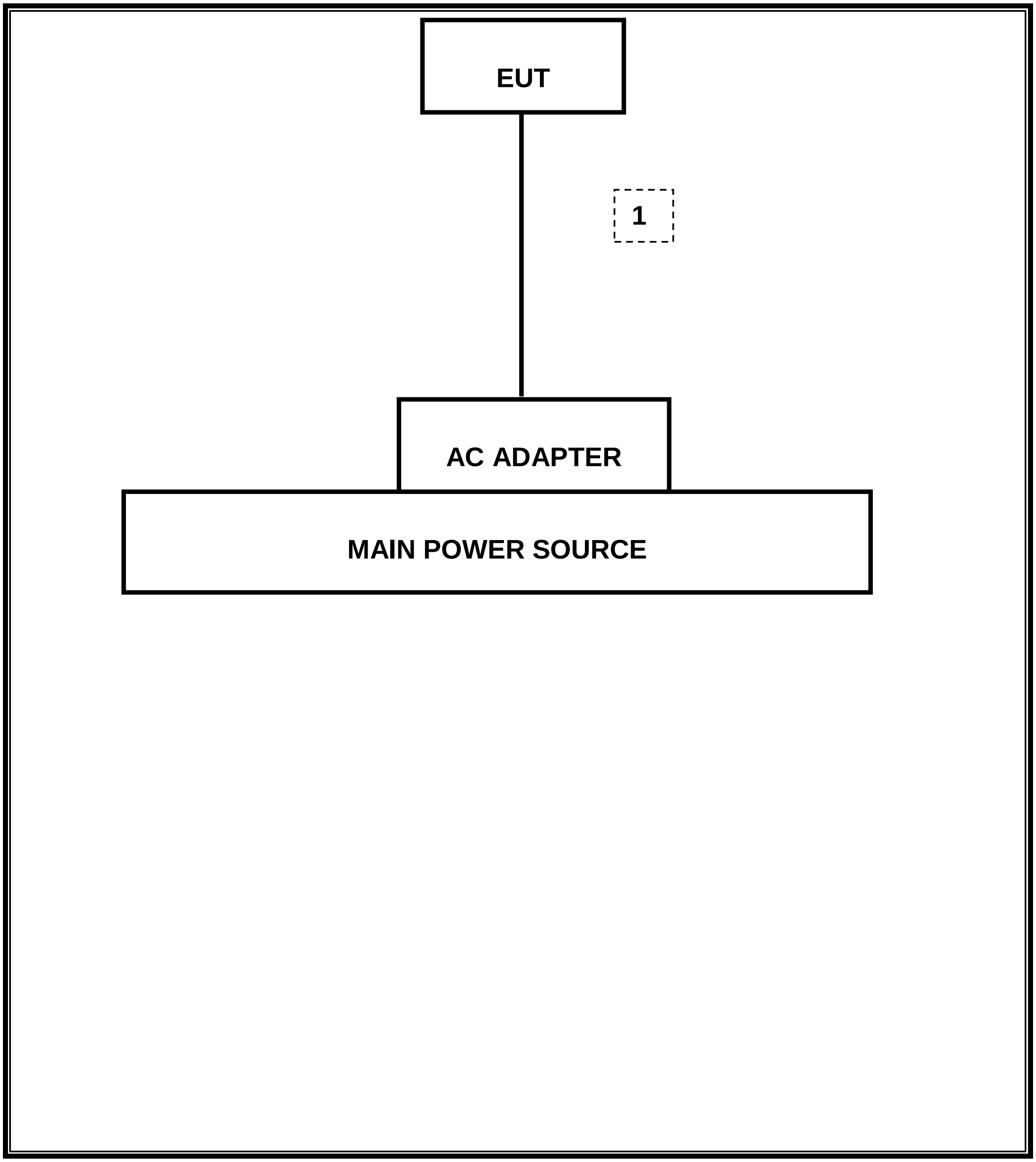
I/O CABLES

Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	Mini USB	Shielded	1.2m	N/A

TEST SETUP

The EUT is continuously transmitting Bluetooth through the EUT’s software.

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment List				
Description	**Manufacturer**	**Model**	**Asset**	**Cal Due**
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C00986	4/1/2015
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01179	2/26/2015
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	8/8/2015
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00580	5/8/2015
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01063	10/22/2015
Antenna, Bilog, 30MHz-1 GHz	Sunol Sciences	JB1	N/A	3/6/2015
Antenna, Horn, 18 GHz	ETS	3117	C01022	2/21/2015
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00589	12/17/2014
Peak Power Meter	Agilent / HP	E4416A	C00963	12/13/2014
Peak / Average Power Sensor	Agilent / HP	E9327A	C00964	12/13/2014
LISN, 30 MHz	FCC	50/250-25-2	C00626	1/14/2015

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NIST USA.

Test Software List			
Description	**Manufacturer**	**Model**	**Version**
Radiated Software	UL	UL EMC	Version 9.5, 07/22/14
Conducted Software	UL	UL EMC	Version 9.5, 05/17/14
Antenna Port Software	UL	UL RF	Version 2.1.1.1, 1/20/15

7. MEASUREMENT METHODS

Duty Cycle: KDB 558074 D01 v03r05, Section 6.0

6 dB BW: KDB 558074 D01 v03r05, Section 8.1.

99% BW: ANSI C63.10-2013, Section 6.9.3.

Output Power: KDB 558074 D01 v03r05, Section 9.1.1.

Power Spectral Density: KDB 558074 D01 v03r05, Section 10.2.

Out-of-band emissions in non-restricted bands: KDB 558074 D01 v03r05, Section 11.0.

Out-of-band emissions in restricted bands: KDB 558074 D01 v03r05, Section 12.1, 12.2

AC Power Line Conducted Emissions: ANSI C63.10-2013 Section 6.2.

8. SUMMARY

FCC Part Section	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result
15.247 (a)(2)	RSS-247 5.2 (1)	Occupied Band width (6dB) with 99%	>500KHz	Conducted	Pass
2.1051, 15.247 (d)	RSS-247 5.5	Band Edge / Conducted Spurious Emission	-20dBc		Pass
15.247	RSS-247 5.4 (4)	TX conducted output power	<30dBm		Pass
15.247	RSS-247 5.2 (2)	PSD	<8dBm		Pass
15.207 (a)	RSS-GEN 8.8	AC Power Line conducted emissions	Section 10	Radiated	Pass
15.205, 15.209	RSS-GEN 8.9	Radiated Spurious Emission	< 54dBuV/m		Pass

9. ANTENNA PORT TEST RESULTS

9.1. ON TIME, DUTY CYCLE

LIMITS

None; for reporting purposes only

PROCEDURE

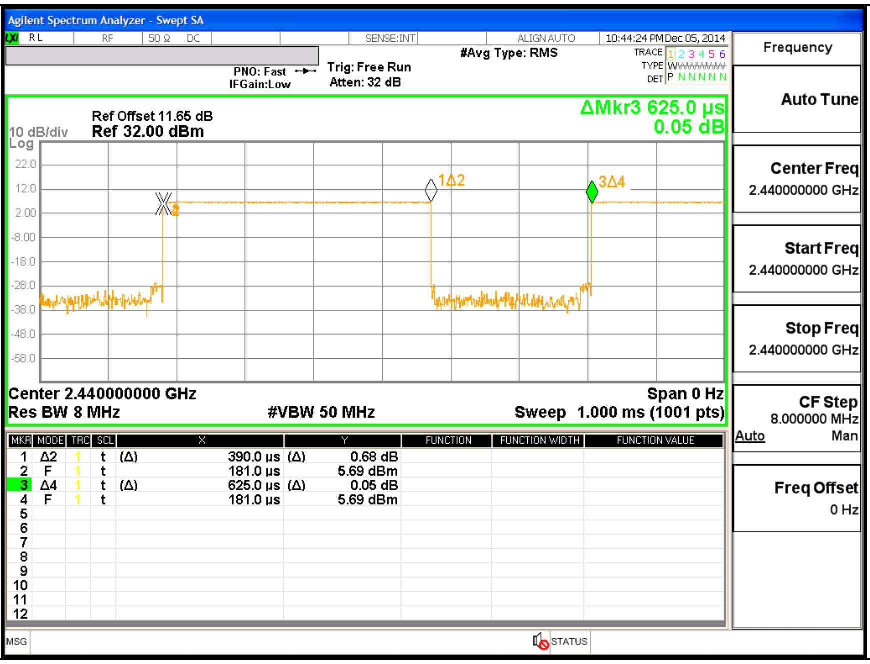
KDB 558074 Zero-Span Spectrum Analyzer Method

RESULTS

ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/T Minimum VBW (kHz)
BLE	0.390	0.626	0.623	62.34%	2.05	2.564

DUTY CYCLE PLOTS



Agilent Spectrum Analyzer - Swept SA

10:44:24 PM Dec 05, 2014

#Avg Type: RMS

PNO: Fast
IFGain:Low

Trig: Free Run
Atten: 32 dB

ΔMkr3 625.0 µs
0.05 dB

Ref Offset 11.65 dB
Ref 32.00 dBm

10 dB/div
Log

Center 2.440000000 GHz
Res BW 8 MHz
#VBW 50 MHz
Span 0 Hz
Sweep 1.000 ms (1001 pts)

MKR	MODE	TRC	SCL	X		Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	Δ2	1	t	(Δ) 390.0 µs	(Δ)	0.68 dB			
2	F	1	t	181.0 µs		5.69 dBm			
3	Δ4	1	t	(Δ) 625.0 µs	(Δ)	0.05 dB			
4	F	1	t	181.0 µs		5.69 dBm			
5									
6									
7									
8									
9									
10									
11									
12									

Center Freq 2.440000000 GHz
Start Freq 2.440000000 GHz
Stop Freq 2.440000000 GHz
CF Step 8.000000 MHz
Freq Offset 0 Hz

NOTE: --

9.2. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

The minimum 6 dB bandwidth shall be at least 500 kHz.

TEST PROCEDURE

KDB 58074 D01 v03r05 Section 8.1

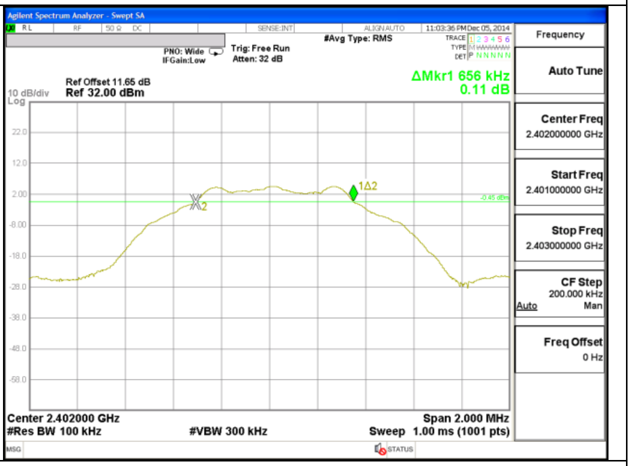
RESULTS

6 dB BANDWIDTH PLOTS AND TABLE

6 dB TEST RESULT TABLE

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.6560	0.5
Middle	2440	0.7100	0.5
High	2480	0.6980	0.5

LOW CHANNEL



Agilent Spectrum Analyzer - Swept SA

11:03:36 PM Dec 05, 2014

#Avg Type: RMS

PNO: Wide

IFGain:Low

Trig: Free Run

Atten: 32 dB

Ref Offset 11.65 dB

10 dB/div Ref 32.00 dBm

ΔMkr1 656 kHz 0.11 dB

Center Freq 2.402000000 GHz

Start Freq 2.401000000 GHz

Stop Freq 2.403000000 GHz

CF Step 200.000 kHz Auto Man

Freq Offset 0 Hz

Center 2.402000 GHz

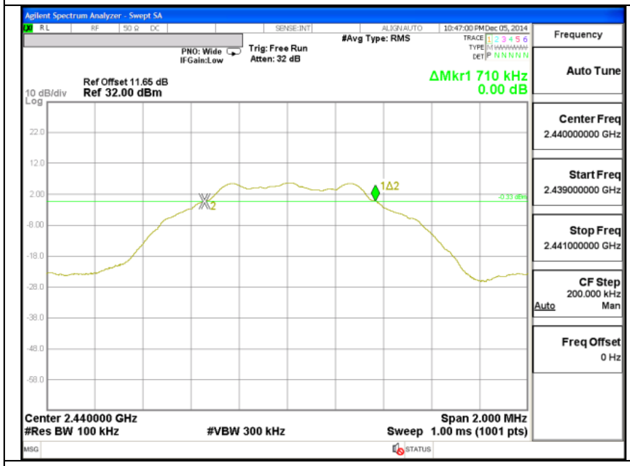
#Res BW 100 kHz

#VBW 300 kHz

Span 2.000 MHz

Sweep 1.00 ms (1001 pts)

MID CHANNEL



Agilent Spectrum Analyzer - Swept SA

10:47:00 PM Dec 05, 2014

#Avg Type: RMS

PNO: Wide

IFGain:Low

Trig: Free Run

Atten: 32 dB

Ref Offset 11.65 dB

10 dB/div Ref 32.00 dBm

ΔMkr1 710 kHz 0.00 dB

Center Freq 2.440000000 GHz

Start Freq 2.439000000 GHz

Stop Freq 2.441000000 GHz

CF Step 200.000 kHz Auto Man

Freq Offset 0 Hz

Center 2.440000 GHz

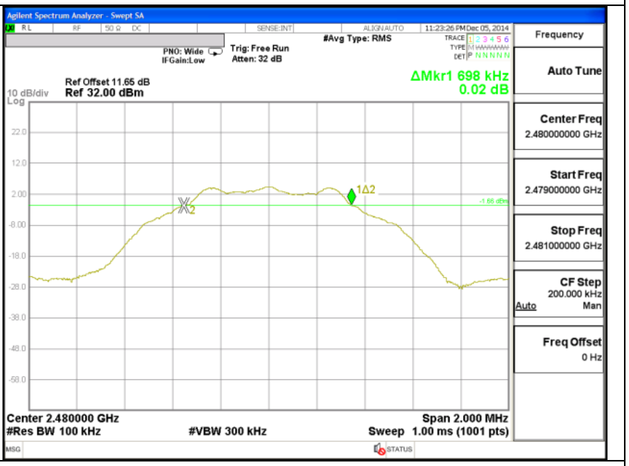
#Res BW 100 kHz

#VBW 300 kHz

Span 2.000 MHz

Sweep 1.00 ms (1001 pts)

HIGH CHANNEL



Agilent Spectrum Analyzer - Swept SA

11:23:26 PM Dec 05, 2014

#Avg Type: RMS

PNO: Wide

IFGain:Low

Trig: Free Run

Atten: 32 dB

Ref Offset 11.65 dB

10 dB/div Ref 32.00 dBm

ΔMkr1 698 kHz 0.02 dB

Center Freq 2.480000000 GHz

Start Freq 2.479000000 GHz

Stop Freq 2.481000000 GHz

CF Step 200.000 kHz Auto Man

Freq Offset 0 Hz

Center 2.480000 GHz

#Res BW 100 kHz

#VBW 300 kHz

Span 2.000 MHz

Sweep 1.00 ms (1001 pts)

NOTE:

9.3. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth and to 1% of the span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

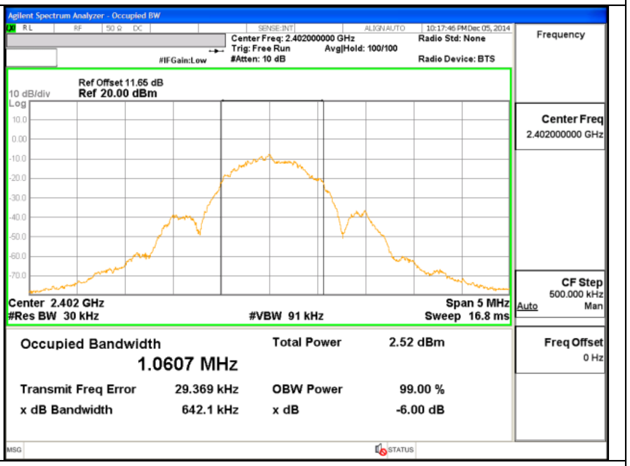
RESULTS

99% BANDWIDTH PLOTS AND TABLE

99% TEST RESULT TABLE

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.0607
Middle	2440	1.0603
High	2480	1.0623

LOW CHANNEL


Agilent Spectrum Analyzer - Occupied BW

10:17:46 PM Dec 05, 2014

Center Freq: 2.402000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 10 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS

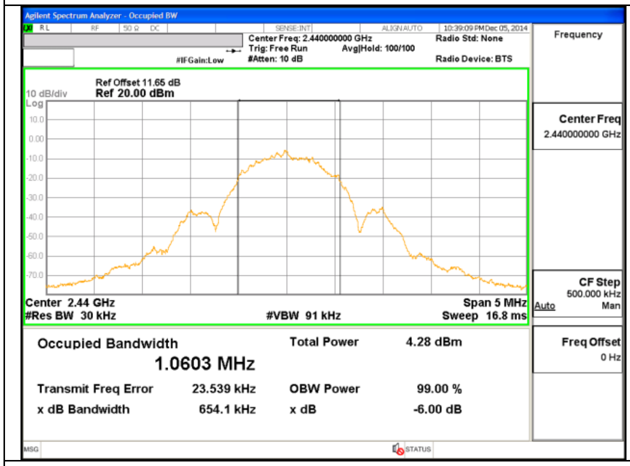
Ref Offset 11.65 dB
Ref 20.00 dBm
10 dB/div Log

Center 2.402 GHz
#Res BW 30 kHz
#VBW 91 kHz
Span 5 MHz
Sweep 16.8 ms

Occupied Bandwidth 1.0607 MHz
Total Power 2.52 dBm
Transmit Freq Error 29.369 kHz
OBW Power 99.00 %
x dB Bandwidth 642.1 kHz
x dB -6.00 dB

Center Freq 2.402000000 GHz
CF Step 500.000 kHz Auto Man
Freq Offset 0 Hz

MID CHANNEL


Agilent Spectrum Analyzer - Occupied BW

10:39:09 PM Dec 05, 2014

Center Freq: 2.440000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 10 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS

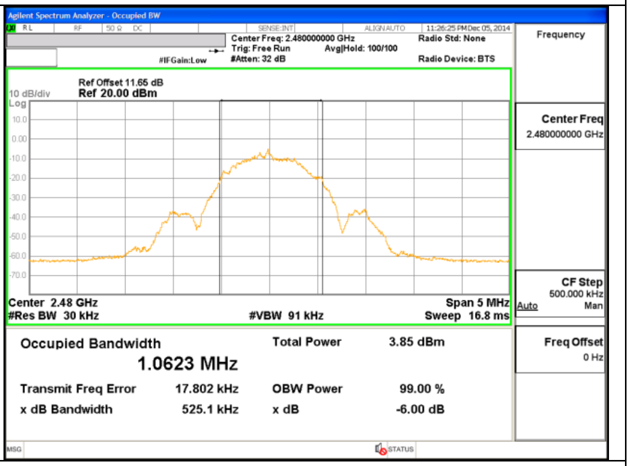
Ref Offset 11.65 dB
Ref 20.00 dBm
10 dB/div Log

Center 2.44 GHz
#Res BW 30 kHz
#VBW 91 kHz
Span 5 MHz
Sweep 16.8 ms

Occupied Bandwidth 1.0603 MHz
Total Power 4.28 dBm
Transmit Freq Error 23.539 kHz
OBW Power 99.00 %
x dB Bandwidth 654.1 kHz
x dB -6.00 dB

Center Freq 2.440000000 GHz
CF Step 500.000 kHz Auto Man
Freq Offset 0 Hz

HIGH CHANNEL


Agilent Spectrum Analyzer - Occupied BW

11:26:25 PM Dec 05, 2014

Center Freq: 2.480000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 32 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS

Ref Offset 11.65 dB
Ref 20.00 dBm
10 dB/div Log

Center 2.48 GHz
#Res BW 30 kHz
#VBW 91 kHz
Span 5 MHz
Sweep 16.8 ms

Occupied Bandwidth 1.0623 MHz
Total Power 3.85 dBm
Transmit Freq Error 17.802 kHz
OBW Power 99.00 %
x dB Bandwidth 525.1 kHz
x dB -6.00 dB

Center Freq 2.480000000 GHz
CF Step 500.000 kHz Auto Man
Freq Offset 0 Hz

NOTE:

9.4. OUTPUT POWER

LIMITS

FCC §15.247 (b)

The maximum antenna gain is less than or equal to 6dBi, therefore the limit is 30 dBm.

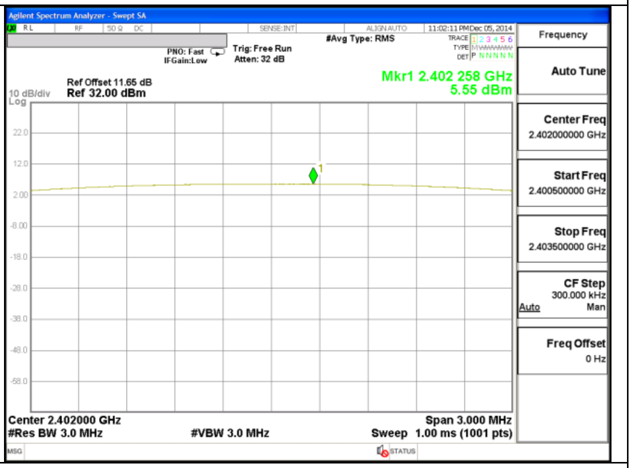
RESULTS

OUTPUT POWER PLOTS AND TABLE

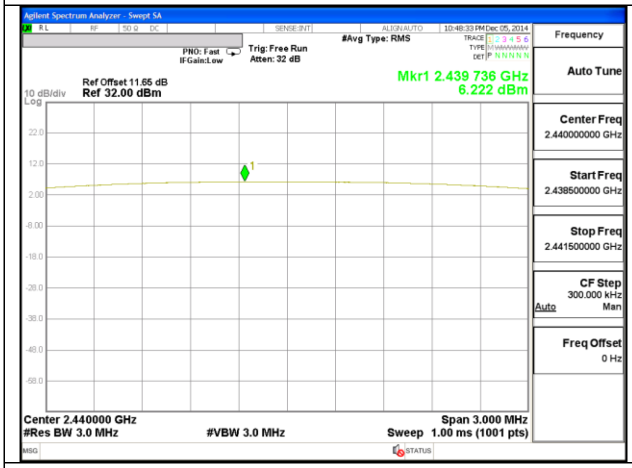
OUTPUT POWER TEST RESULT TABLE

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	5.550	30	-24.45
Middle	2440	6.222	30	-23.78
High	2480	5.870	30	-24.13

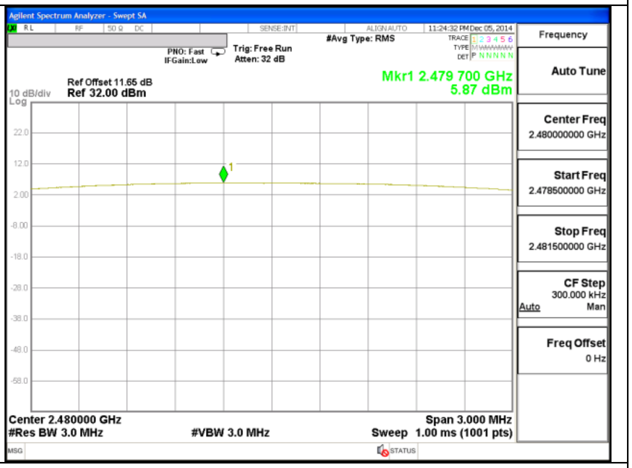
LOW CHANNEL



MID CHANNEL



HIGH CHANNEL



NOTE:

9.5. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

AVERAGE POWER

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	5.44
Middle	2440	6.08
High	2480	5.23

NOTE: --

9.6. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

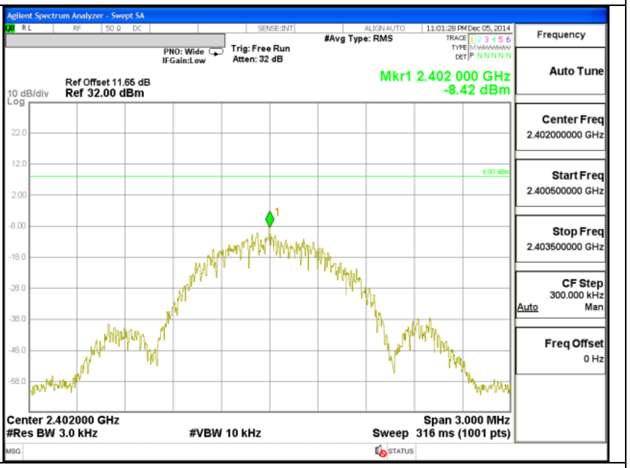
RESULTS

POWER SPECTRAL DENSITY PLOTS AND TABLE

POWER SPECTRAL DENSITY TEST RESULT TABLE

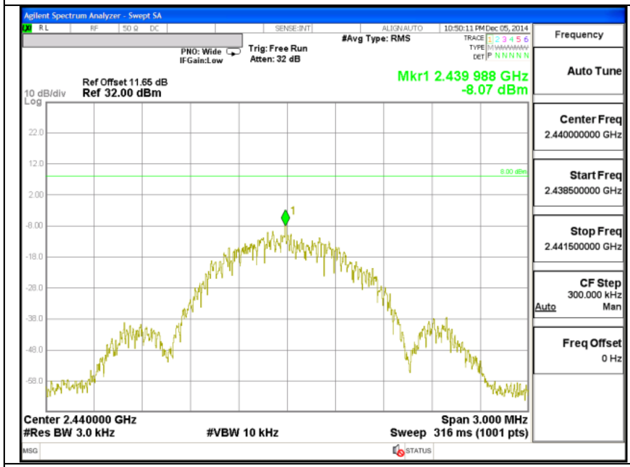
Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2402	-8.42	8	-16.42
Middle	2440	-8.07	8	-16.07
High	2480	-8.09	8	-16.09

LOW CHANNEL



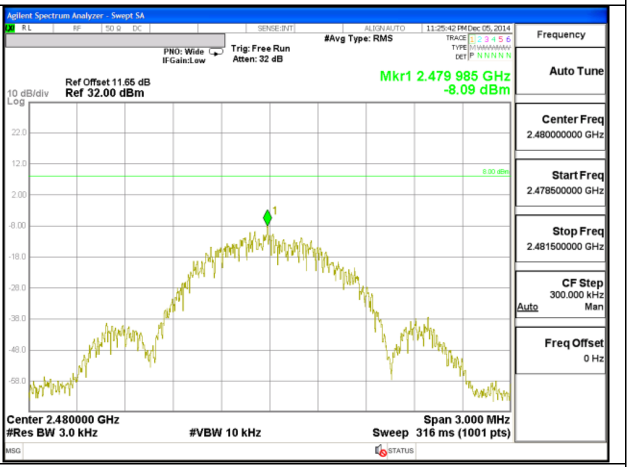
Agilent Spectrum Analyzer - Swept SA
11:01:28 PM Dec 05, 2014
#Avg Type: RMS
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 32 dB
Ref Offset 11.65 dB
Ref 32.00 dBm
Mkr1 2.402 000 GHz
-8.42 dBm
Center Freq 2.402000000 GHz
Start Freq 2.400500000 GHz
Stop Freq 2.403500000 GHz
CF Step 300.000 kHz
Freq Offset 0 Hz
Center 2.402000 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 3.000 MHz
Sweep 316 ms (1001 pts)

MID CHANNEL



Agilent Spectrum Analyzer - Swept SA
10:50:11 PM Dec 05, 2014
#Avg Type: RMS
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 32 dB
Ref Offset 11.65 dB
Ref 32.00 dBm
Mkr1 2.439 988 GHz
-8.07 dBm
Center Freq 2.440000000 GHz
Start Freq 2.438500000 GHz
Stop Freq 2.441500000 GHz
CF Step 300.000 kHz
Freq Offset 0 Hz
Center 2.440000 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 3.000 MHz
Sweep 316 ms (1001 pts)

HIGH CHANNEL



Agilent Spectrum Analyzer - Swept SA
11:25:42 PM Dec 05, 2014
#Avg Type: RMS
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 32 dB
Ref Offset 11.65 dB
Ref 32.00 dBm
Mkr1 2.479 985 GHz
-8.09 dBm
Center Freq 2.480000000 GHz
Start Freq 2.478500000 GHz
Stop Freq 2.481500000 GHz
CF Step 300.000 kHz
Freq Offset 0 Hz
Center 2.480000 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 3.000 MHz
Sweep 316 ms (1001 pts)

NOTE:

9.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

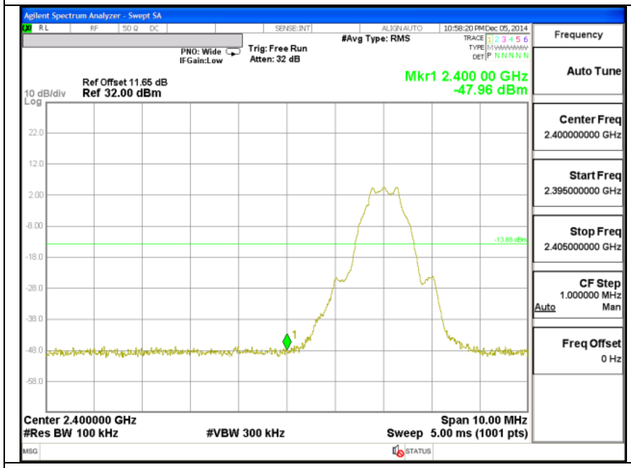
FCC §15.247 (d)

Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

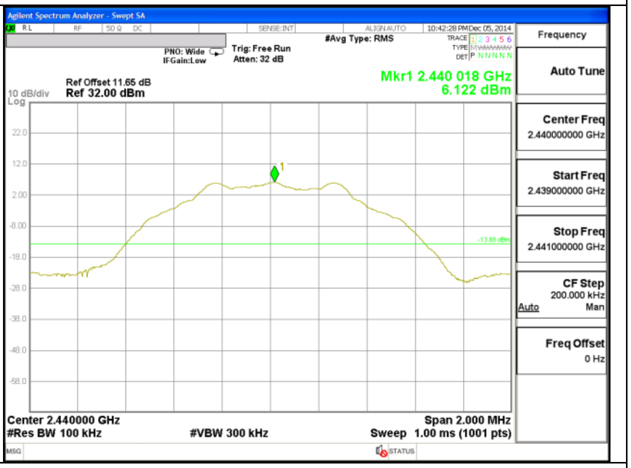
RESULTS

BANDEDGE AND SPURIOUS EMISSIONS PLOTS

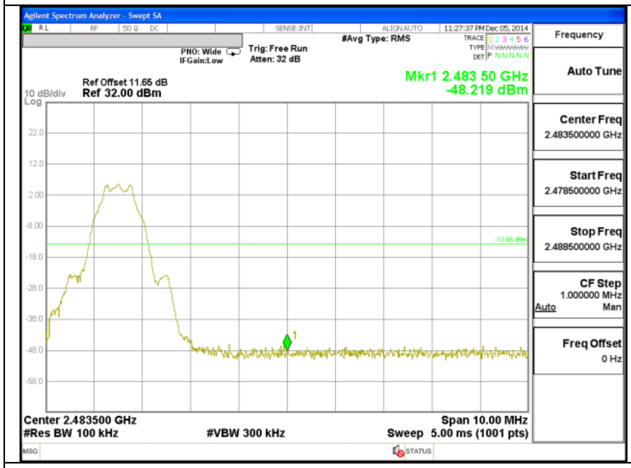
LOW CHANNEL BANDEDGE


Agilent Spectrum Analyzer - Swept SA
10:58:20 PM Dec 05, 2014
PNO: Wide IFGain:Low Trig: Free Run Atten: 32 dB #Avg Type: RMS
Ref Offset 11.65 dB
10 dB/div Ref 32.00 dBm
Mkr1 2.400 00 GHz -47.96 dBm
Center 2.400000 GHz Span 10.00 MHz
#Res BW 100 kHz #VBW 300 kHz Sweep 5.00 ms (1001 pts)
Center Freq 2.400000000 GHz
Start Freq 2.395000000 GHz
Stop Freq 2.405000000 GHz
CF Step 1.000000 MHz Auto Man
Freq Offset 0 Hz

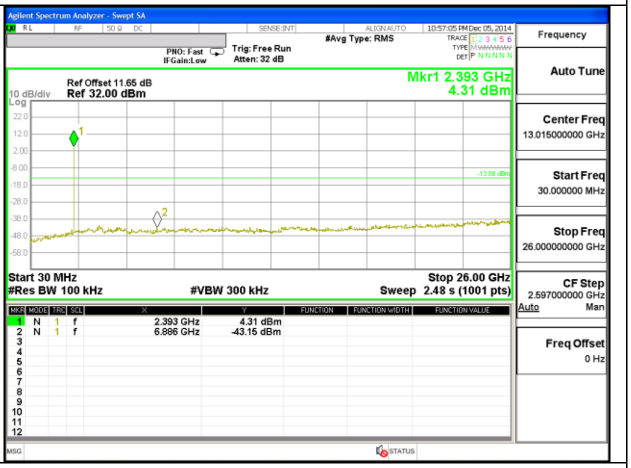
MID CHANNEL REFERENCE


Agilent Spectrum Analyzer - Swept SA
10:42:28 PM Dec 05, 2014
PNO: Wide IFGain:Low Trig: Free Run Atten: 32 dB #Avg Type: RMS
Ref Offset 11.65 dB
10 dB/div Ref 32.00 dBm
Mkr1 2.440 018 GHz 6.122 dBm
Center 2.440000 GHz Span 2.000 MHz
#Res BW 100 kHz #VBW 300 kHz Sweep 1.00 ms (1001 pts)
Center Freq 2.440000000 GHz
Start Freq 2.439000000 GHz
Stop Freq 2.441000000 GHz
CF Step 200.000 kHz Auto Man
Freq Offset 0 Hz

HIGH CHANNEL BANDEDGE


Agilent Spectrum Analyzer - Swept SA
11:27:37 PM Dec 05, 2014
PNO: Wide IFGain:Low Trig: Free Run Atten: 32 dB #Avg Type: RMS
Ref Offset 11.65 dB
10 dB/div Ref 32.00 dBm
Mkr1 2.483 50 GHz -48.219 dBm
Center 2.483500 GHz Span 10.00 MHz
#Res BW 100 kHz #VBW 300 kHz Sweep 5.00 ms (1001 pts)
Center Freq 2.483500000 GHz
Start Freq 2.478500000 GHz
Stop Freq 2.488500000 GHz
CF Step 1.000000 MHz Auto Man
Freq Offset 0 Hz

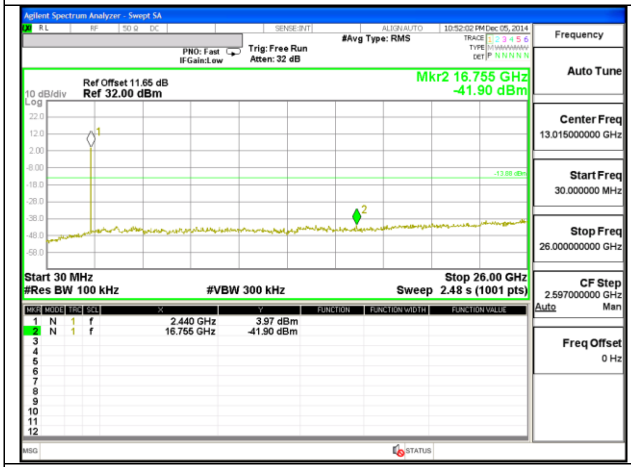
LOW CHANNEL SPURIOUS


Agilent Spectrum Analyzer - Swept SA
10:57:05 PM Dec 05, 2014
PNO: Fast IFGain:Low Trig: Free Run Atten: 32 dB #Avg Type: RMS
Ref Offset 11.65 dB
10 dB/div Ref 32.00 dBm
Mkr1 2.393 GHz 4.31 dBm
Start 30 MHz Stop 26.00 GHz
#Res BW 100 kHz #VBW 300 kHz Sweep 2.48 s (1001 pts)

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.393 GHz	4.31 dBm			
2	N	1	f	6.886 GHz	-43.15 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

Center Freq 13.015000000 GHz
Start Freq 30.000000 MHz
Stop Freq 26.000000000 GHz
CF Step 2.597000000 GHz Auto Man
Freq Offset 0 Hz

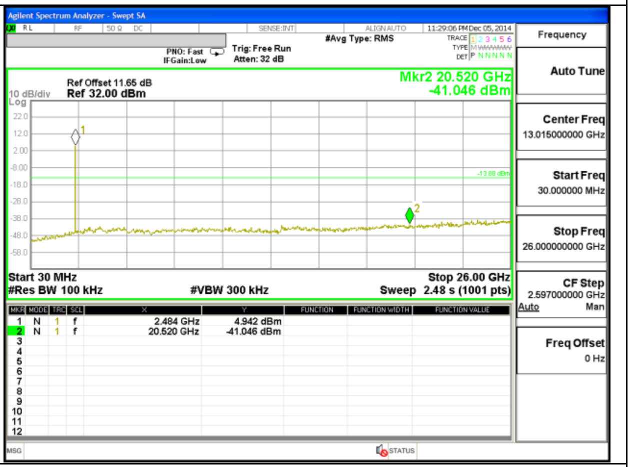
MID CHANNEL SPURIOUS


Agilent Spectrum Analyzer - Swept SA
10:52:02 PM Dec 05, 2014
PNO: Fast IFGain:Low Trig: Free Run Atten: 32 dB #Avg Type: RMS
Ref Offset 11.65 dB
10 dB/div Ref 32.00 dBm
Mkr2 16.755 GHz -41.90 dBm
Start 30 MHz Stop 26.00 GHz
#Res BW 100 kHz #VBW 300 kHz Sweep 2.48 s (1001 pts)

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.440 GHz	3.97 dBm			
2	N	1	f	16.755 GHz	-41.90 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

Center Freq 13.015000000 GHz
Start Freq 30.000000 MHz
Stop Freq 26.000000000 GHz
CF Step 2.597000000 GHz Auto Man
Freq Offset 0 Hz

HIGH CHANNEL SPURIOUS


Agilent Spectrum Analyzer - Swept SA
11:29:06 PM Dec 05, 2014
PNO: Fast IFGain:Low Trig: Free Run Atten: 32 dB #Avg Type: RMS
Ref Offset 11.65 dB
10 dB/div Ref 32.00 dBm
Mkr2 20.520 GHz -41.046 dBm
Start 30 MHz Stop 26.00 GHz
#Res BW 100 kHz #VBW 300 kHz Sweep 2.48 s (1001 pts)

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.484 GHz	4.942 dBm			
2	N	1	f	20.520 GHz	-41.046 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

Center Freq 13.015000000 GHz
Start Freq 30.000000 MHz
Stop Freq 26.000000000 GHz
CF Step 2.597000000 GHz Auto Man
Freq Offset 0 Hz

NOTE:

10. RADIATED TEST RESULTS

LIMITS AND PROCEDURE

FCC §15.205 and §15.209

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane for below 1GHz and 150cm for above 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and add duty cycle factor for average measurements. Duty cycle factor = 10 log (1/x). For this sample: DCF = 10log (1/0.624)=2.05dB

The spectrum from 1GHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

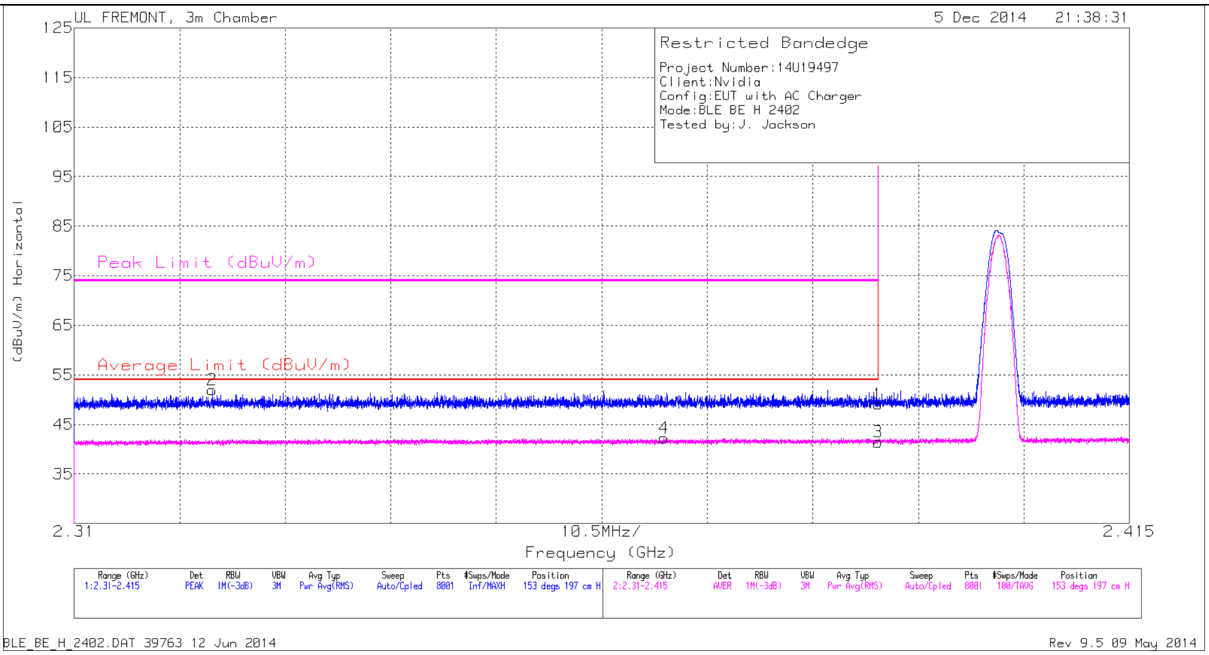
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

RESULTS

10.1. TRANSMITTER ABOVE 1 GHz

RESTRICTED BANDEDGE (LOW CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



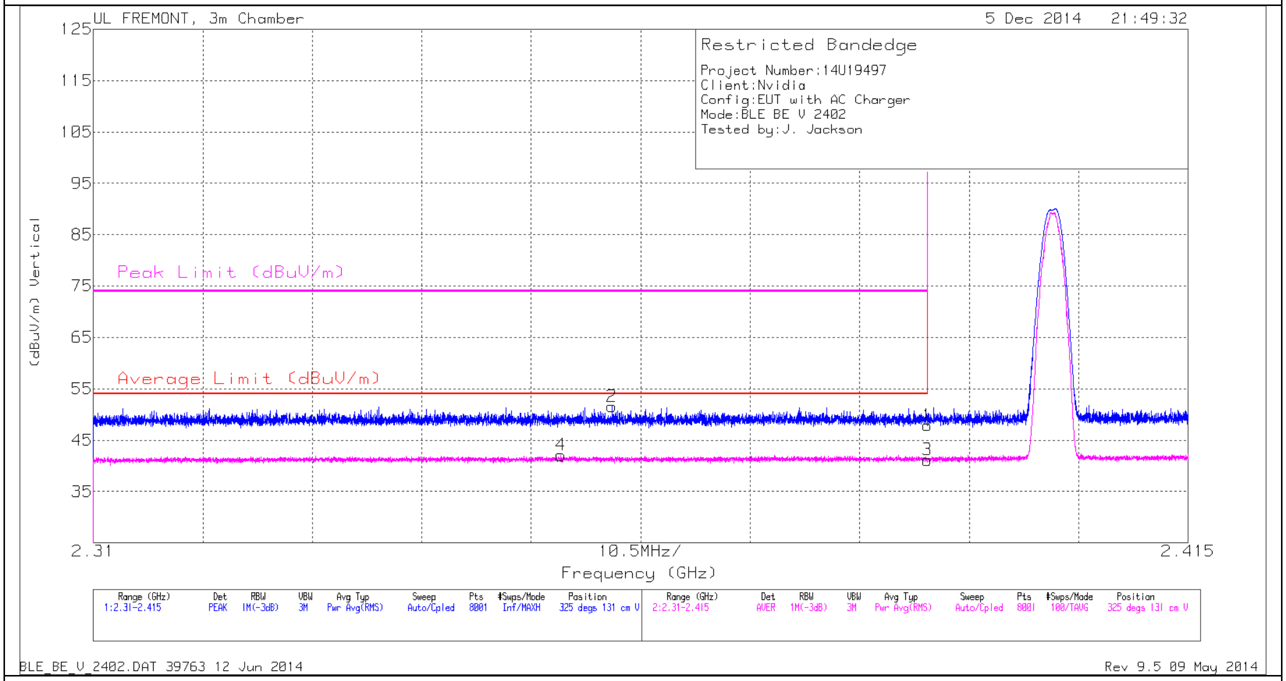
HORIZONTAL VERTICAL PEAK AND AVERAGE DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	2.324	43.17	PK	31.9	-23.1	0	51.97	-	-	74	-22.03	153	197	H
4	2.369	31.28	RMS	32	-23.1	2.1	42.28	54	-11.72	-	-	153	197	H
1	2.39	40.1	PK	32.1	-23.1	0	49.1	-	-	74	-24.9	153	197	H
3	2.39	30.4	RMS	32.1	-23.1	2.1	41.5	54	-12.5	-	-	153	197	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band
PK - Peak detector
RMS - RMS detection

RESTRICTED BANDEDGE (LOW CHANNEL)

VERTICAL PEAK AND AVERAGE PLOT



Restricted Bandedge

Project Number:14U19497
Client:Nvidia
Config:EUT with AC Charger
Mode:BLE BE V 2402
Tested by:J. Jackson

Range (GHz)	Det	RBW	VBW	Avg Typ	Sweep	Pts	#Swps/Mode	Position
1:2.31-2.415	PEAK	1M(-3dB)	3M	Pwr Avg(RMS)	Auto/Cpled	8001	Inf/MAXH	325 degs 131 cm V
2:2.31-2.415	AVER	1M(-3dB)	3M	Pwr Avg(RMS)	Auto/Cpled	8001	100/TAVG	325 degs 131 cm V

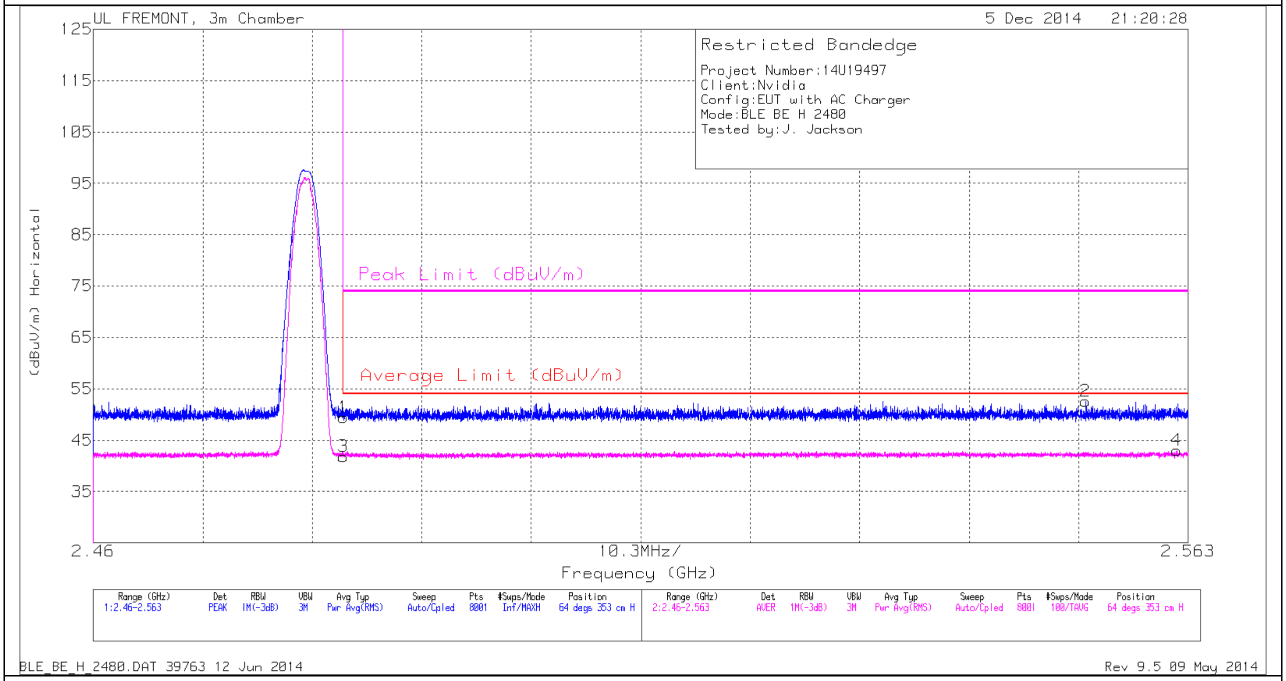
VERTICAL PEAK AND AVERAGE DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	2.355	31.11	RMS	32	-23.1	2.1	42.11	54	-11.89	-	-	325	131	V
2	2.36	42.69	PK	32	-23.1	0	51.59	-	-	74	-22.41	325	131	V
1	2.39	38.88	PK	32.1	-23.1	0	47.88	-	-	74	-26.12	325	131	V
3	2.39	30.09	RMS	32.1	-23.1	2.1	41.19	54	-12.81	-	-	325	131	V

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band
PK - Peak detector
RMS - RMS detection

RESTRICTED BANDEDGE (HIGH CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



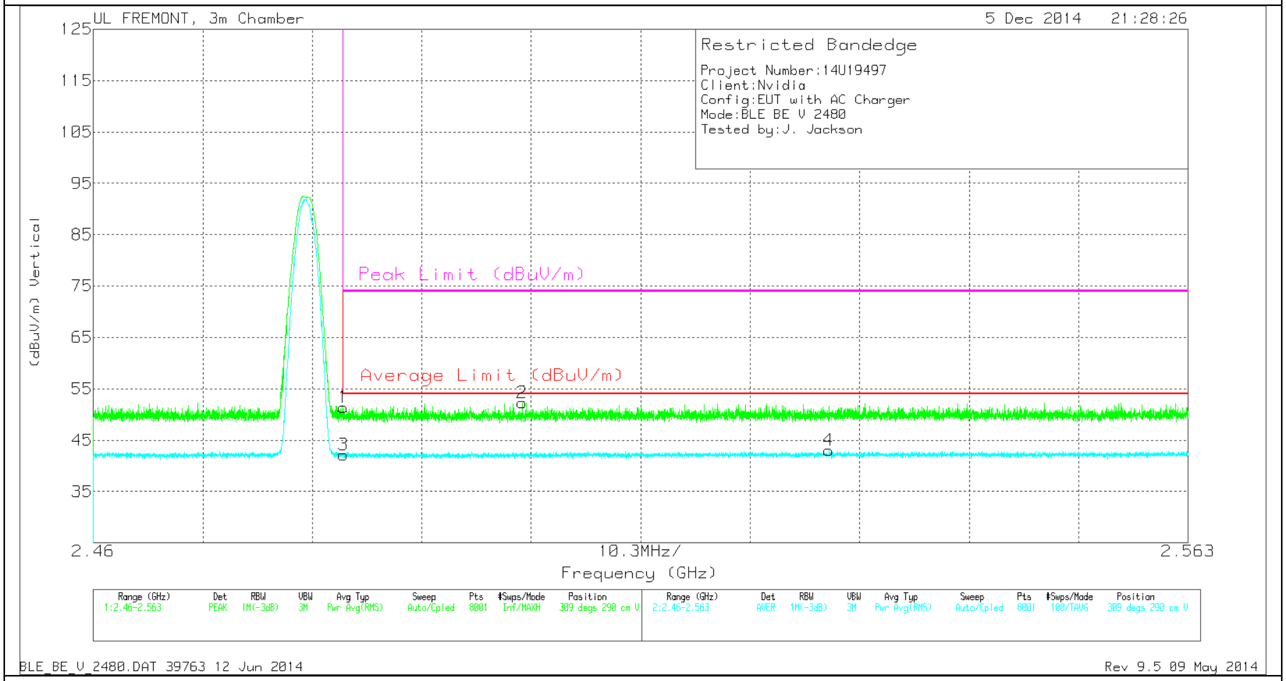
HORIZONTAL PEAK AND AVERAGE DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.484	39.96	PK	32.3	-22.8	0	49.46	-	-	74	-24.54	64	353	H
3	2.484	30.24	RMS	32.3	-22.8	2.1	41.84	54	-12.16	-	-	64	353	H
2	2.553	42.87	PK	32.4	-22.7	0	52.57	-	-	74	-21.43	64	353	H
4	2.562	31.26	RMS	32.4	-22.7	2.1	43.06	54	-10.94	-	-	64	353	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band
PK - Peak detector
RMS - RMS detection

RESTRICTED BANDEDGE (HIGH CHANNEL)

VERTICAL PEAK AND AVERAGE PLOT



Restricted Bandedge

Project Number:14U19497
Client:Nvidia
Config:EUT with AC Charger
Mode:BLE BE V 2480
Tested by:J. Jackson

Range (GHz)	Det	RBW	VBW	Avg Typ	Sweep	Pts	#Swps/Mode	Position
1:2.46-2.563	PEAK	1M(-3dB)	3M	Pwr Avg(RMS)	Auto/Cpled	8001	Inf/MAXH	309 degs 290 cm V
2:2.46-2.563	AVER	1M(-3dB)	3M	Pwr Avg(RMS)	Auto/Cpled	8001	100/TAVG	309 degs 290 cm V

BLE_BE_V_2480.DAT 39763 12 Jun 2014

Rev 9.5 09 May 2014

VERTICAL PEAK AND AVERAGE DATA

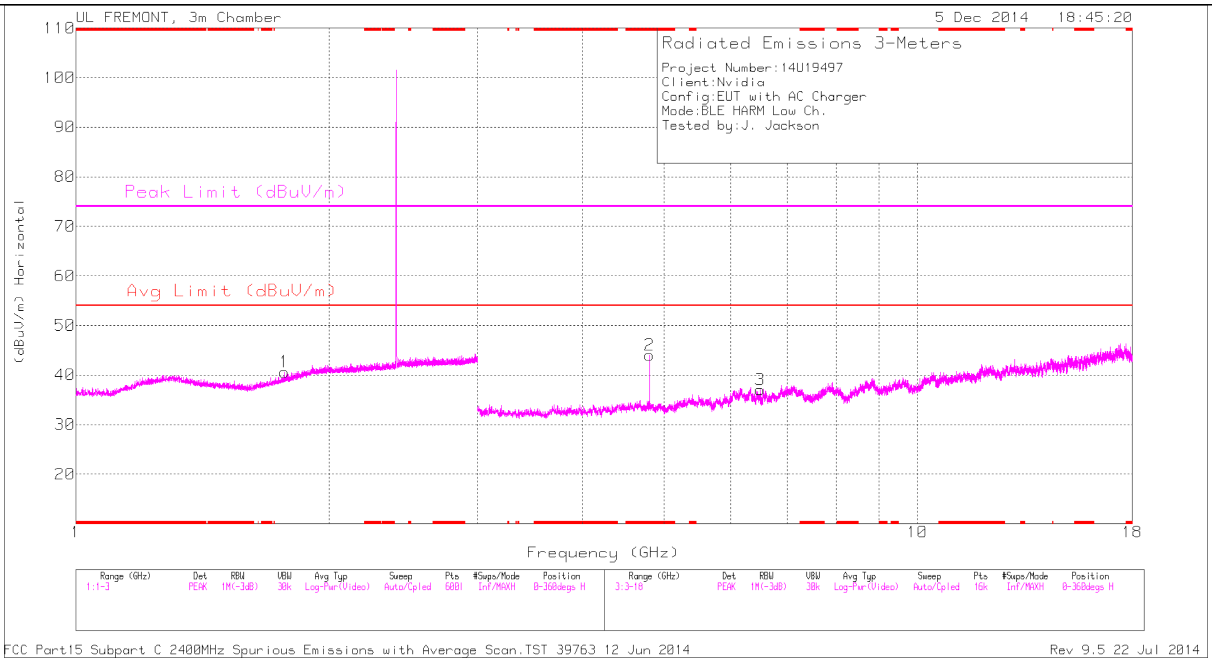
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.484	41.86	PK	32.3	-22.8	0	51.36	-	-	74	-22.64	309	290	V
3	2.484	30.61	RMS	32.3	-22.8	2.1	42.21	54	-11.79	-	-	309	290	V
2	2.5	42.7	PK	32.3	-22.7	0	52.3	-	-	74	-21.7	309	290	V
4	2.529	31.15	RMS	32.4	-22.6	2.1	43.05	54	-10.95	-	-	309	290	V

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band
PK - Peak detector
RMS - RMS detection

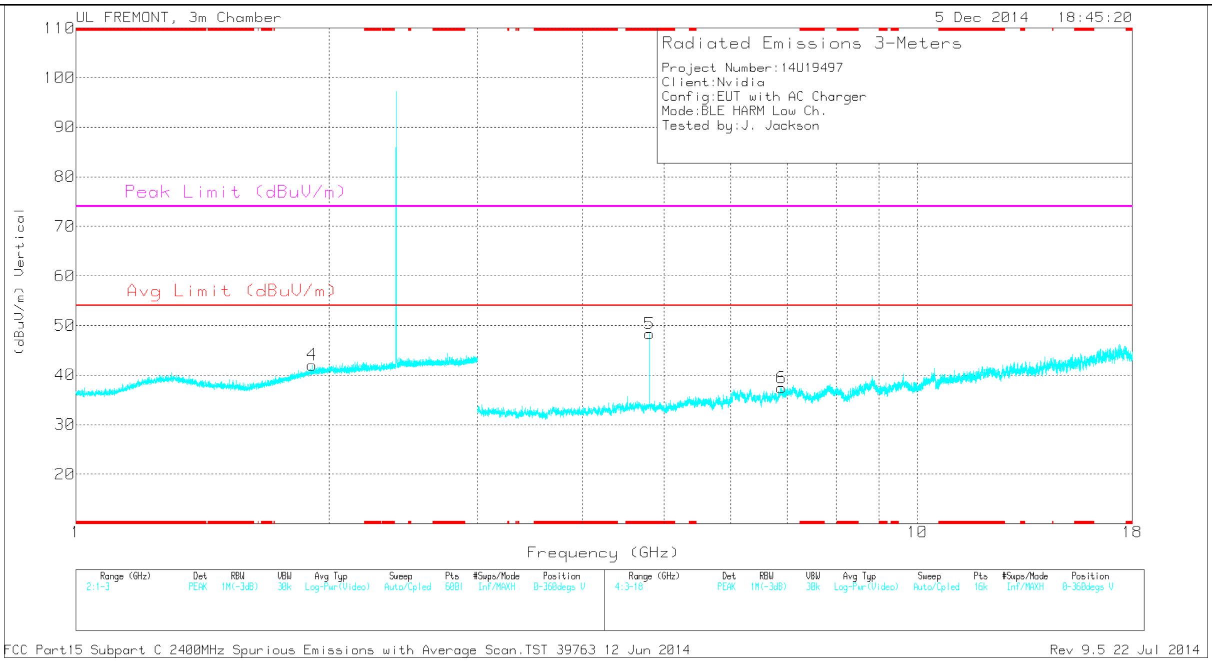
HARMONICS AND SPURIOUS EMISSIONS

SPURIOUS (LOW CHANNEL)

HORIZONTAL PLOT



VERTICAL PLOT



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

LOW CHANNEL DATA

TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 4.804	40.25	PK	34.1	-30.3	0	44.05	-	-	74	-29.95	0-360	100	H
5	* 4.805	44.56	PK	34.1	-30.3	0	48.36	-	-	74	-25.64	0-360	200	V
1	1.77	34.16	PK	29.8	-23.3	0	40.66	-	-	-	-	0-360	100	H
4	1.909	33.86	PK	31.3	-23.1	0	42.06	-	-	-	-	0-360	100	V
3	6.499	31.39	PK	35.5	-29.9	0	36.99	-	-	-	-	0-360	200	H
6	6.896	30.33	PK	35.6	-28.5	0	37.43	-	-	-	-	0-360	200	V

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band
PK - Peak detector

Radiated Emissions

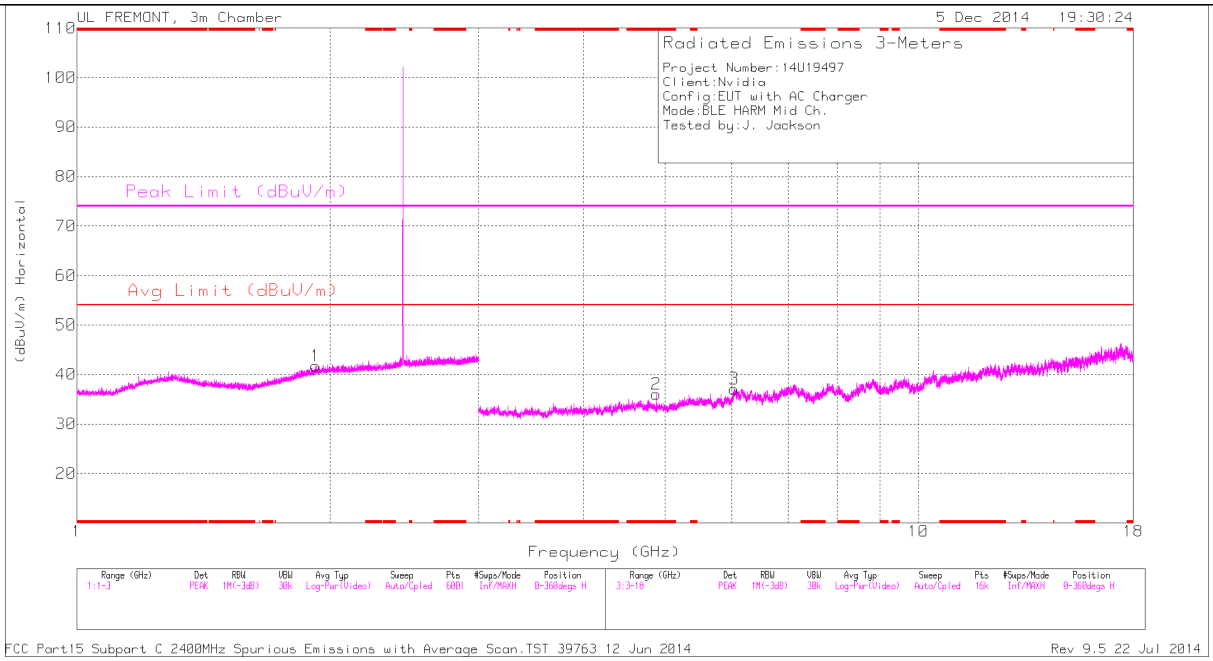
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.804	45.36	PK2	34.1	-30.3	0	49.16	-	-	74	-24.84	0	233	H
* 4.804	36.23	MAv1	34.1	-30.3	2.1	42.13	54	-11.87	-	-	0	233	H
* 4.805	47.06	PK2	34.1	-30.3	0	50.86	-	-	74	-23.14	147	243	V
* 4.804	39.85	MAv1	34.1	-30.3	2.1	45.75	54	-8.25	-	-	147	243	V

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band
PK - Peak detector
RMS - RMS detection

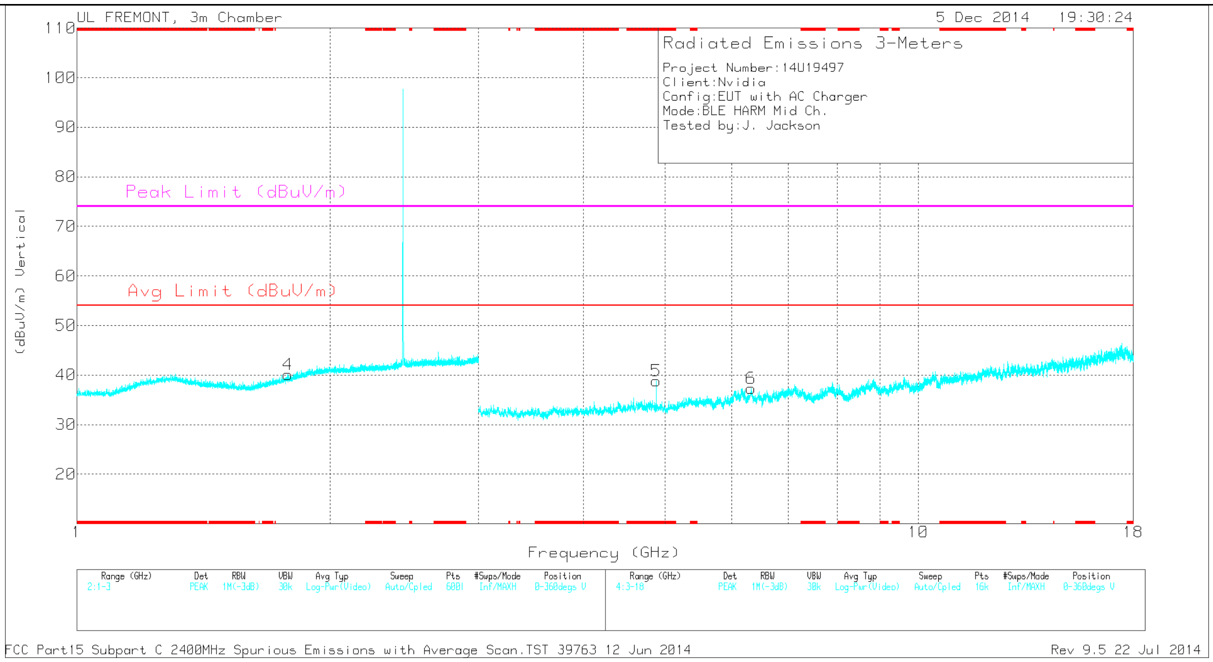
NOTE:

SPURIOUS (MID CHANNEL)

HORIZONTAL PLOT



VERTICAL PLOT



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

MID CHANNEL DATA

TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 4.88	32.23	PK	34	-30.2	0	36.03	-	-	74	-37.97	0-360	200	H
5	* 4.881	35.04	PK	34	-30.2	0	38.84	-	-	74	-35.16	0-360	200	V
4	1.781	33.64	PK	29.9	-23.4	0	40.14	-	-	-	-	0-360	200	V
1	1.922	33.64	PK	31.3	-23.2	0	41.74	-	-	-	-	0-360	200	H
3	6.04	31.11	PK	35.3	-29.3	0	37.11	-	-	-	-	0-360	200	H
6	6.329	30.88	PK	35.4	-29	0	37.28	-	-	-	-	0-360	100	V

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band
PK - Peak detector

Radiated Emissions

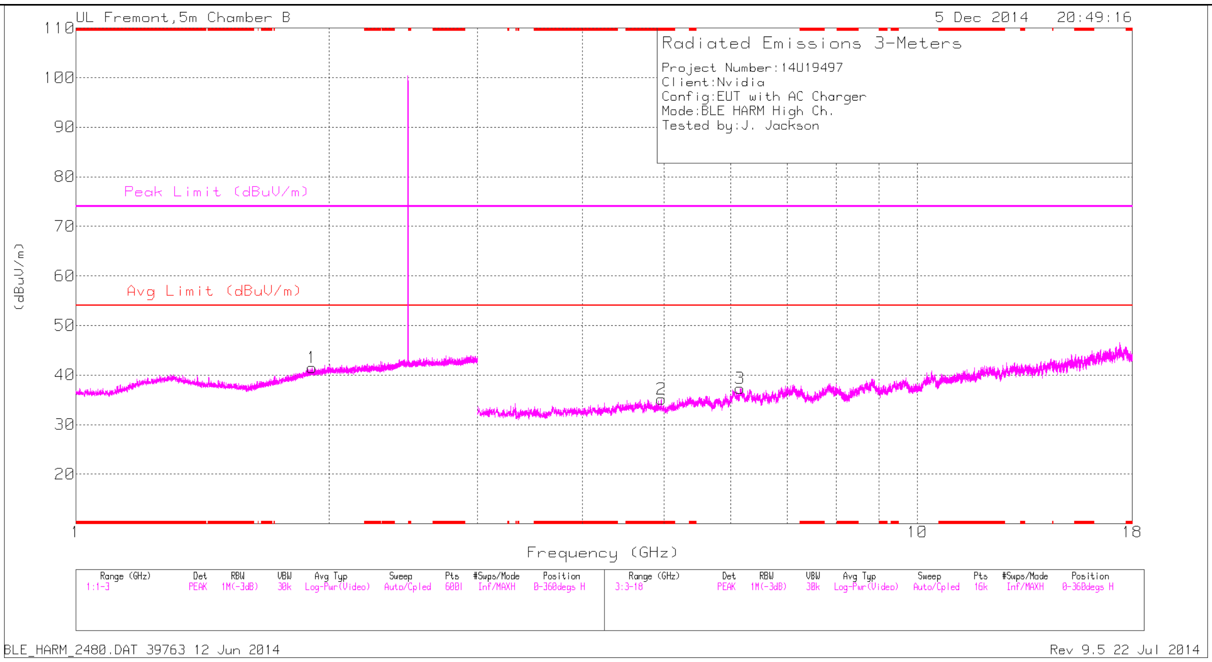
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.88	41.54	PK2	34	-30.2	0	45.34	-	-	74	-28.66	351	282	H
* 4.88	30.35	MAv1	34	-30.2	2.1	36.25	54	-17.75	-	-	351	282	H
* 4.878	41.15	PK2	34	-30.2	0	44.95	-	-	74	-29.05	172	130	V
* 4.88	29.59	MAv1	34	-30.2	2.1	35.49	54	-18.51	-	-	172	130	V

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band
PK - Peak detector
RMS - RMS detection

NOTE:

SPURIOUS (HIGH CHANNEL)

HORIZONTAL PLOT

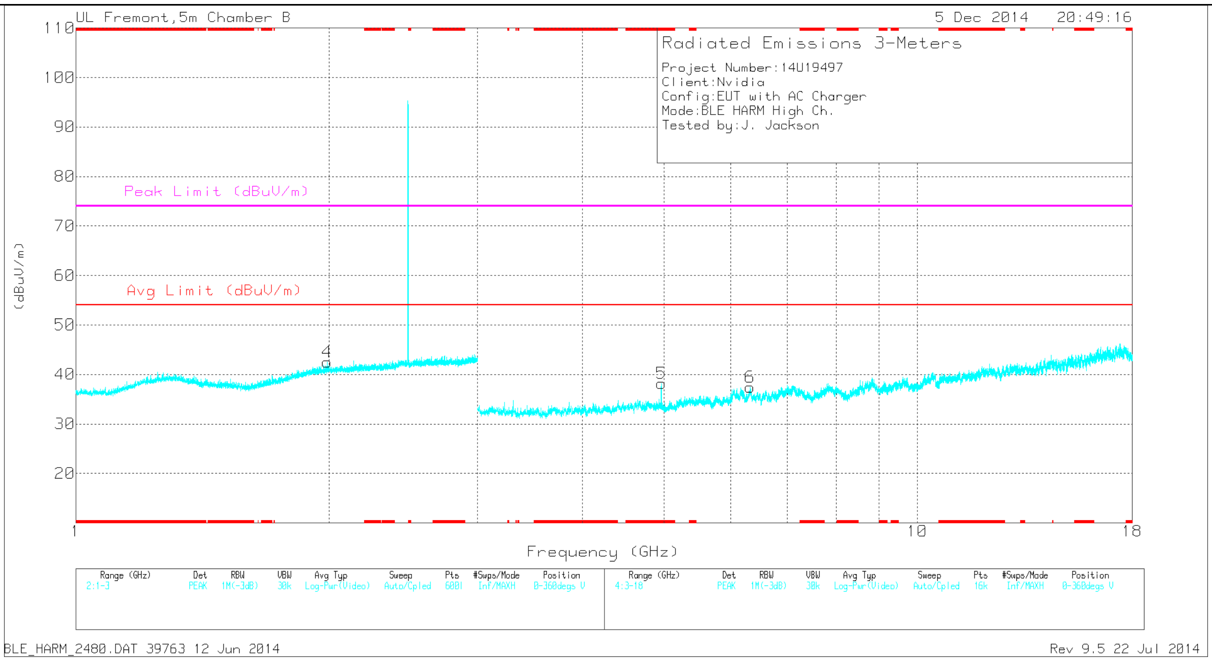


Radiated Emissions 3-Meters

Project Number:14U19497
Client:Nvidia
Config:EUT with AC Charger
Mode:BLE HARM High Ch.
Tested by:J. Jackson

Range (GHz)	Det	RBW	VBW	Avg Typ	Sweep	Pts	#Swps/Mode	Position
1:1-3	PEAK	1M(-3dB)	30k	Log-Pwr(Video)	Auto/Cpled	6001	Inf/MAXH	0-360degs H
3:3-18	PEAK	1M(-3dB)	30k	Log-Pwr(Video)	Auto/Cpled	16k	Inf/MAXH	0-360degs H

VERTICAL PLOT



Radiated Emissions 3-Meters

Project Number:14U19497
Client:Nvidia
Config:EUT with AC Charger
Mode:BLE HARM High Ch.
Tested by:J. Jackson

Range (GHz)	Det	RBW	VBW	Avg Typ	Sweep	Pts	#Swps/Mode	Position
2:1-3	PEAK	1M(-3dB)	30k	Log-Pwr(Video)	Auto/Cpled	6001	Inf/MAXH	0-360degs V
4:3-18	PEAK	1M(-3dB)	30k	Log-Pwr(Video)	Auto/Cpled	16k	Inf/MAXH	0-360degs V

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

HIGH CHANNEL DATA

TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 4.96	32.12	PK	34	-31	0	35.12	-	-	74	-38.88	0-360	200	H
5	* 4.96	35.16	PK	34	-31	0	38.16	-	-	74	-35.84	0-360	200	V
1	1.907	33.34	PK	31.3	-23.2	0	41.44	-	-	-	-	0-360	200	H
4	1.988	34.08	PK	31.6	-23.2	0	42.48	-	-	-	-	0-360	200	V
3	6.158	31.71	PK	35.3	-29.7	0	37.31	-	-	-	-	0-360	200	H
6	6.322	31.32	PK	35.4	-29.3	0	37.42	-	-	-	-	0-360	200	V

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band
PK - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.96	42.56	PK2	34	-31	0	45.56	-	-	74	-28.44	125	153	H
* 4.96	30.63	MAv1	34	-31	2.1	35.73	54	-18.25	-	-	125	153	H
* 4.959	44.21	PK2	34	-31	0	47.21	-	-	74	-26.79	140	258	V
* 4.96	34.23	MAv1	34	-31	2.1	39.33	54	-14.67	-	-	140	258	V

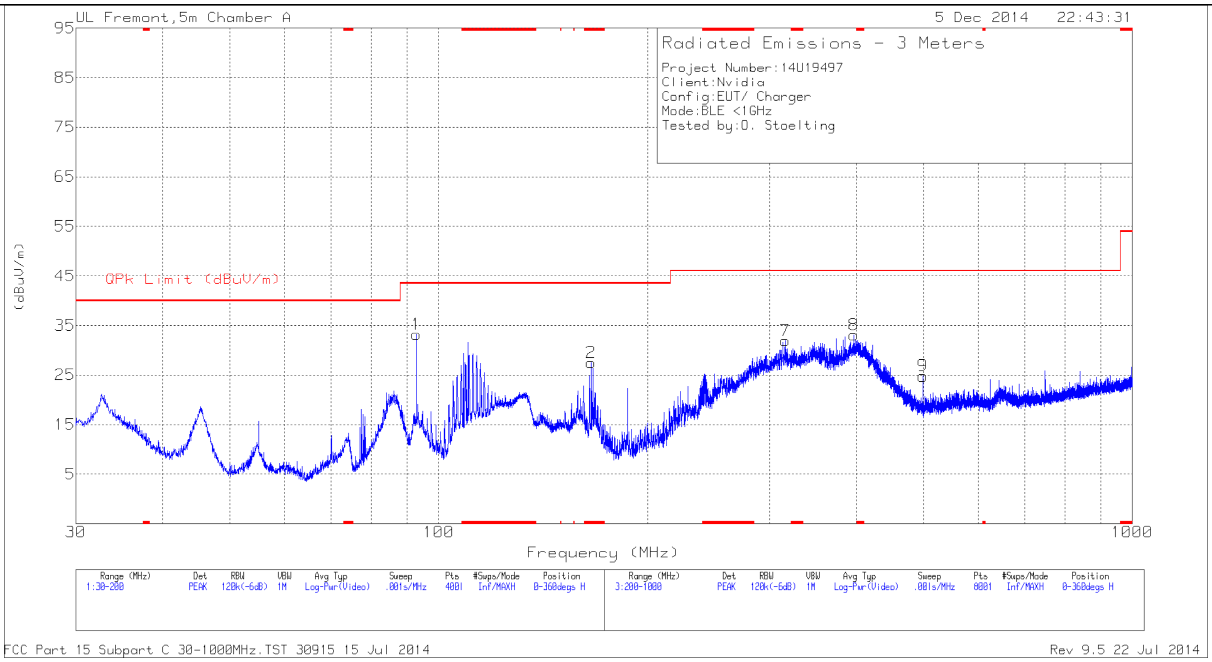
* - indicates frequency in CFR15.205/IC 8.10 Restricted Band
PK - Peak detector
RMS - RMS detection

NOTE:

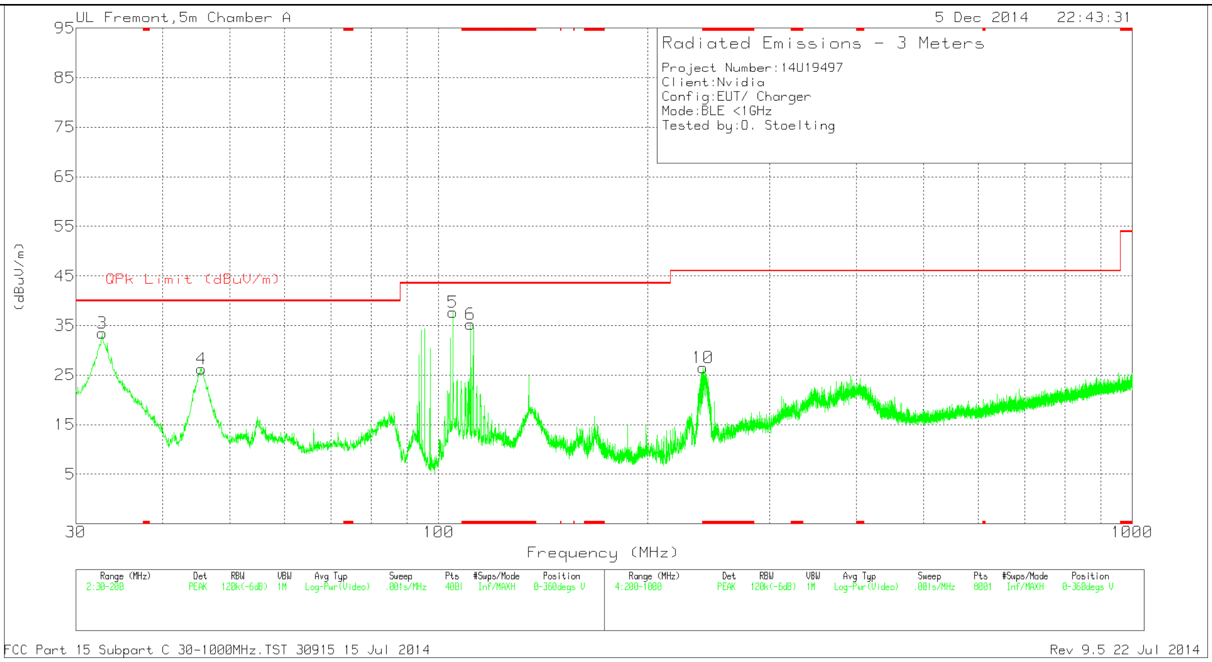
10.1. TRANSMITTER BELOW 1 GHz

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION)

HORIZONTAL PLOT



VERTICAL PLOT



Note: --

BELOW 1 GHz TABLE

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T130 (dB/m)	Amp/Cbl (dB/m)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 165.9575	46	PK	11.7	-30.2	27.5	43.52	-16.02	0-360	400	H
6	* 111.26	52.82	PK	12.8	-30.4	35.22	43.52	-8.3	0-360	101	V
10	* 240.4	44.65	PK	11.5	-29.7	26.45	46.02	-19.57	0-360	101	V
3	32.7625	45.48	PK	19.2	-31.2	33.48	40	-6.52	0-360	101	V
4	45.5125	47.06	PK	10.3	-31.1	26.26	40	-13.74	0-360	101	V
1	92.9	55.57	PK	8.3	-30.6	33.27	43.52	-10.25	0-360	400	H
5	104.885	56.69	PK	11.5	-30.5	37.69	43.52	-5.83	0-360	101	V
7	316.2	47.38	PK	13.9	-29.3	31.98	46.02	-14.04	0-360	101	H
8	396.6	47.14	PK	15.1	-29.1	33.14	46.02	-12.88	0-360	101	H
9	499.2	35.88	PK	17.6	-28.7	24.78	46.02	-21.24	0-360	200	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK - Peak detector

Note: --

11. AC POWER LINE CONDUCTED EMISSIONS

LIMITS AND PROCEDURE

LIMITS

FCC §15.207 (a)

RSS-Gen 8.8

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	**Average**
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

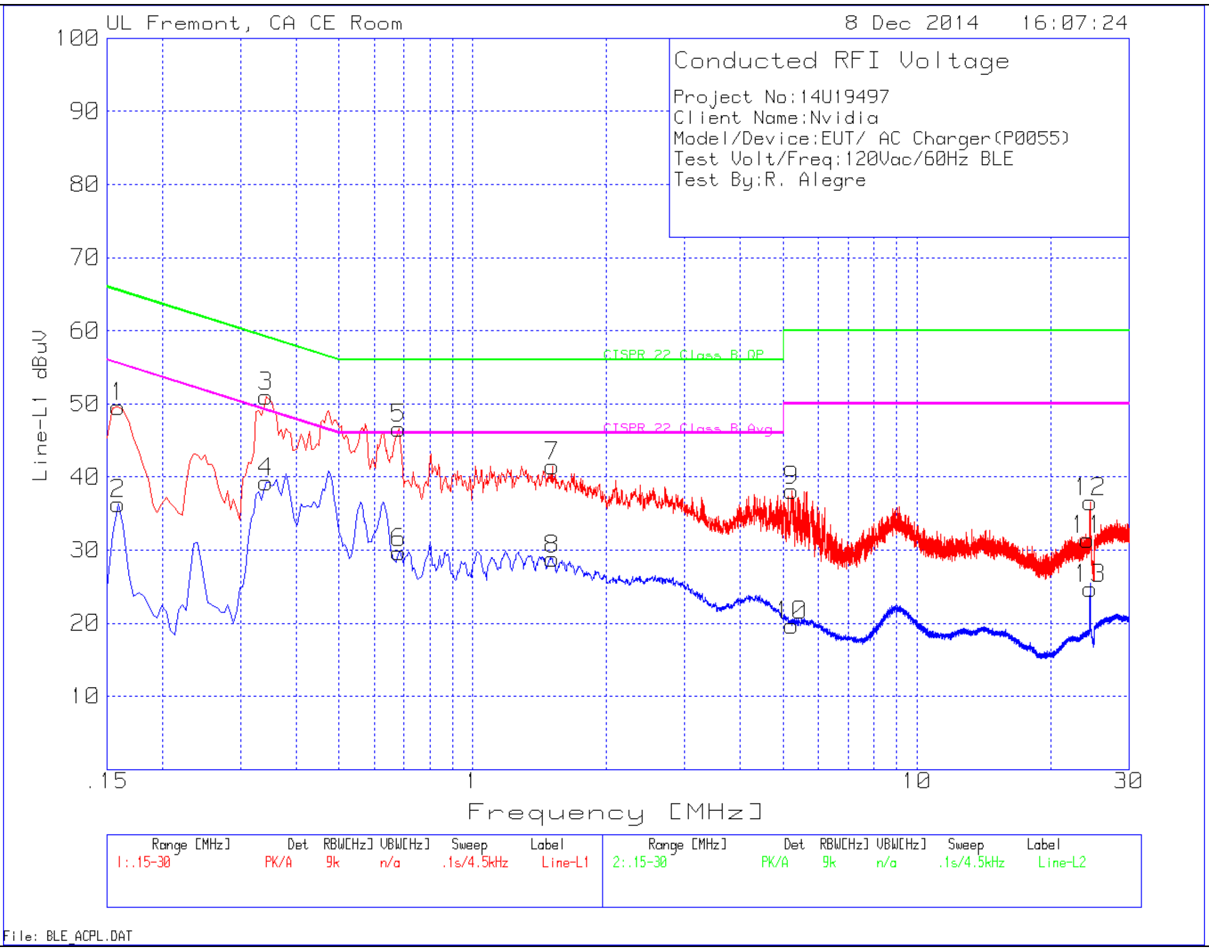
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

RESULTS

6 WORST EMISSIONS

LINE 1 PLOT

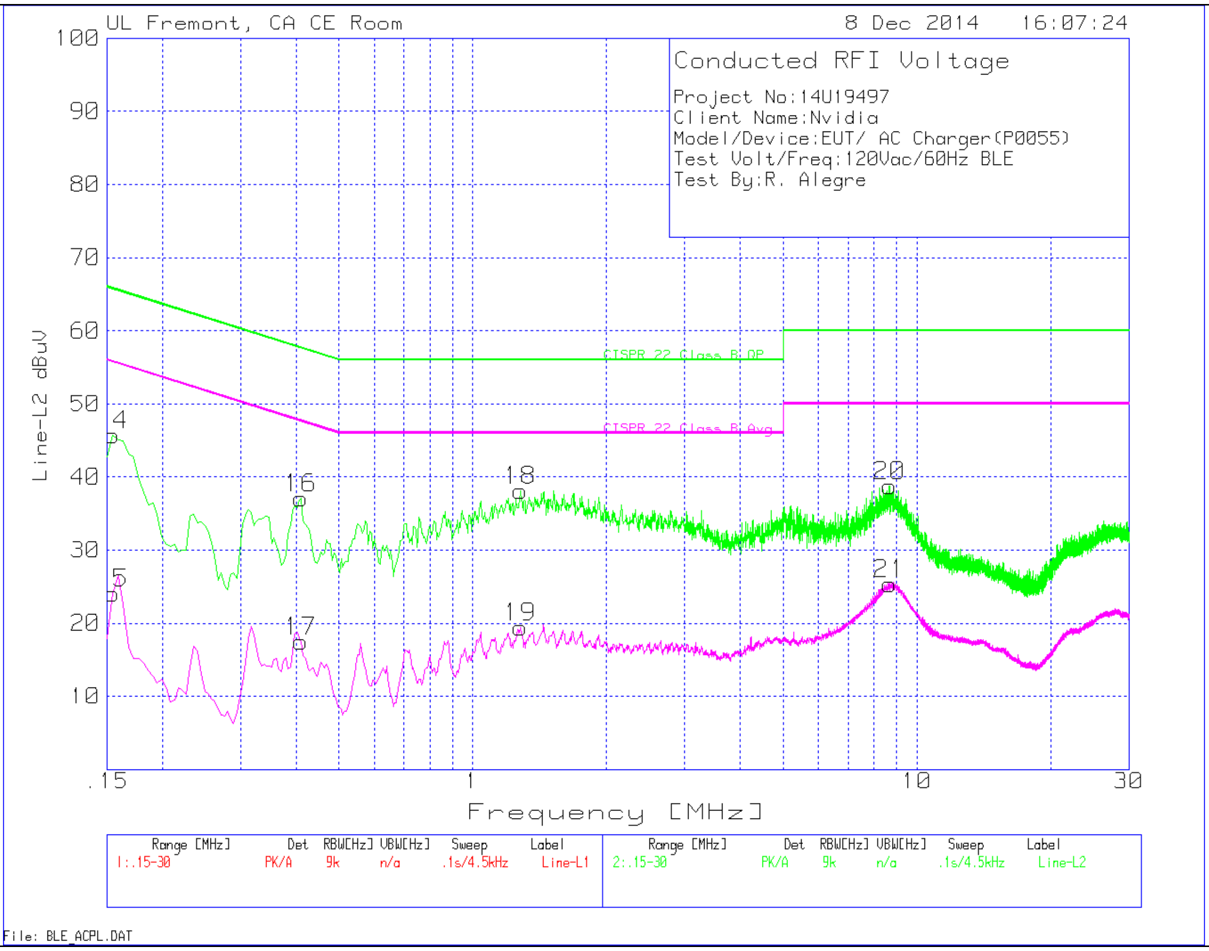


LINE 1 DATA

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1 (dB)	LC Cables 1&3 (dB)	Corrected Reading dBuV	CISPR 22 Class B QP	Margin to Limit (dB)	CISPR 22 Class B Avg	Margin to Limit (dB)
1	.159	48.31	PK	1.3	0	49.61	65.5	-15.89	-	-
2	.159	34.96	Av	1.3	0	36.26	-	-	55.5	-19.24
3	.3435	50.56	PK	.5	0	51.06	59.1	-8.04	-	-
4	.3435	38.79	Av	.5	0	39.29	-	-	49.1	-9.81
5	.681	46.36	PK	.3	0	46.66	56	-9.34	-	-
6	.681	29.37	Av	.3	0	29.67	-	-	46	-16.33
7	1.509	41.17	PK	.2	.1	41.47	56	-14.53	-	-
8	1.509	28.47	Av	.2	.1	28.77	-	-	46	-17.23
9	5.217	37.81	PK	.2	.1	38.11	60	-21.89	-	-
10	5.217	19.37	Av	.2	.1	19.67	-	-	50	-30.33
11	24.2295	30.87	PK	.3	.3	31.47	60	-28.53	-	-
12	24.558	35.93	PK	.3	.3	36.53	60	-23.47	-	-
13	24.558	24.11	Av	.3	.3	24.71	-	-	50	-25.29

LINE 2 PLOT



Conducted RFI Voltage

Project No:14U19497
Client Name:Nvidia
Model/Device:EUT/ AC Charger(P0055)
Test Volt/Freq:120Vac/60Hz BLE
Test By:R. Alegre

Range [MHz]	Det	RBW[Hz]	VBW[Hz]	Sweep	Label
1:.15-30	PK/A	9k	n/a	.1s/4.5kHz	Line-L1
2:.15-30	PK/A	9k	n/a	.1s/4.5kHz	Line-L2

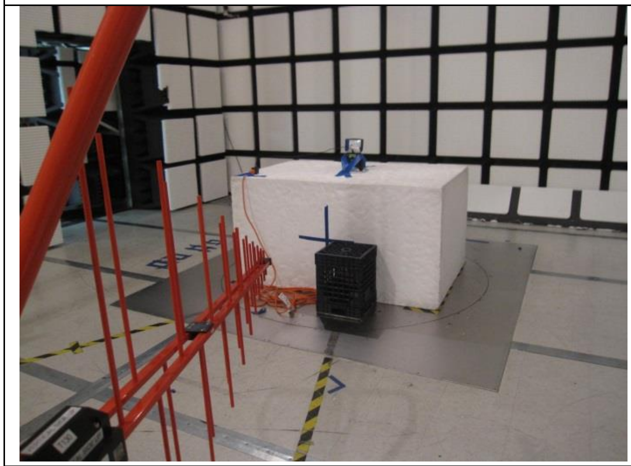
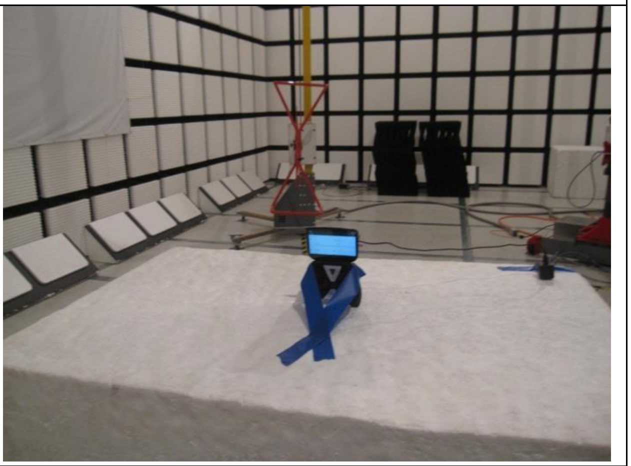
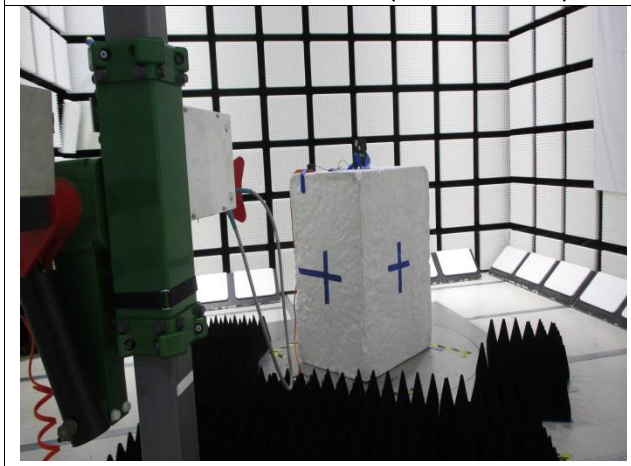
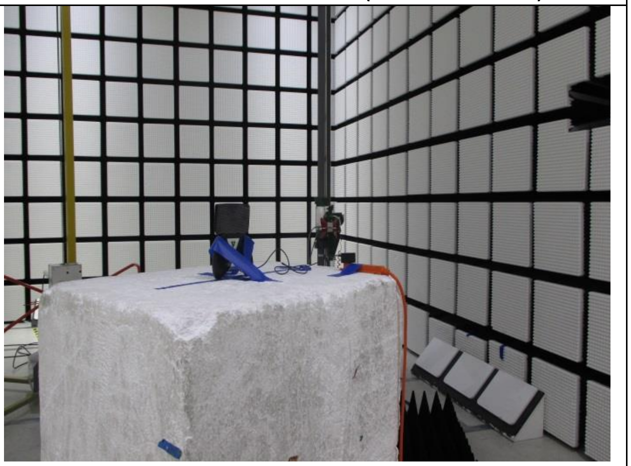
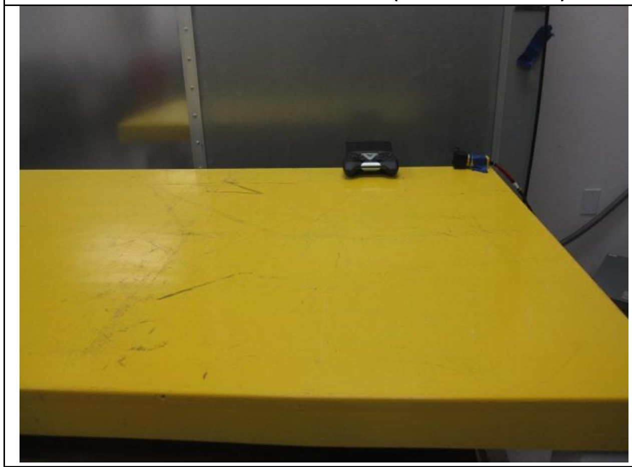
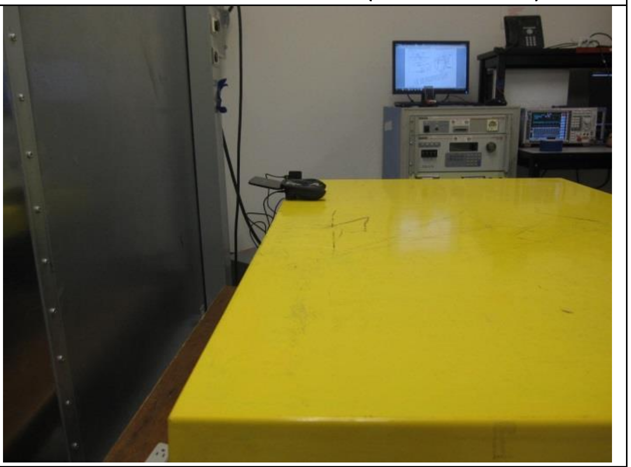
File: BLE_ACPL.DAT

LINE 2 DATA

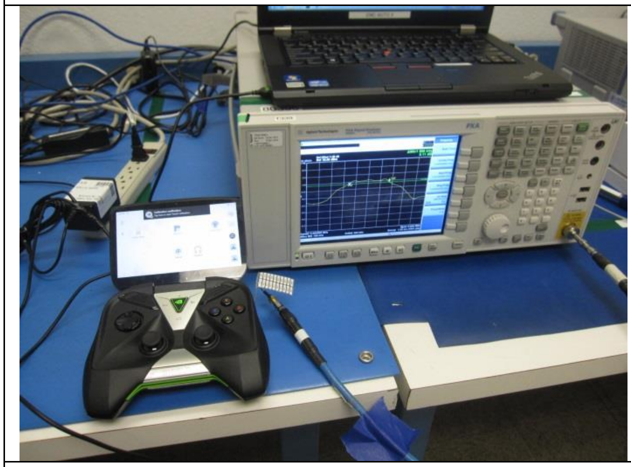
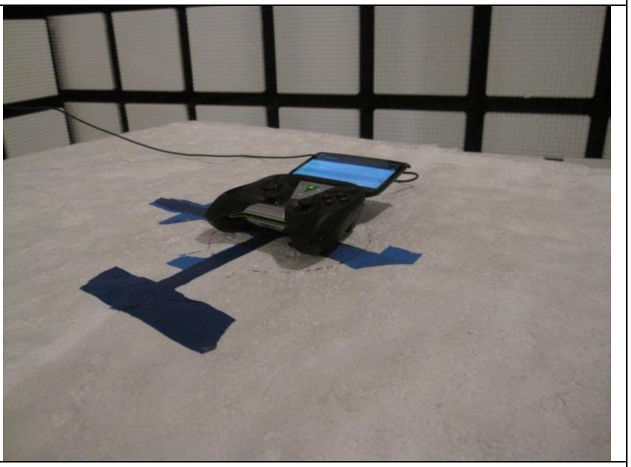
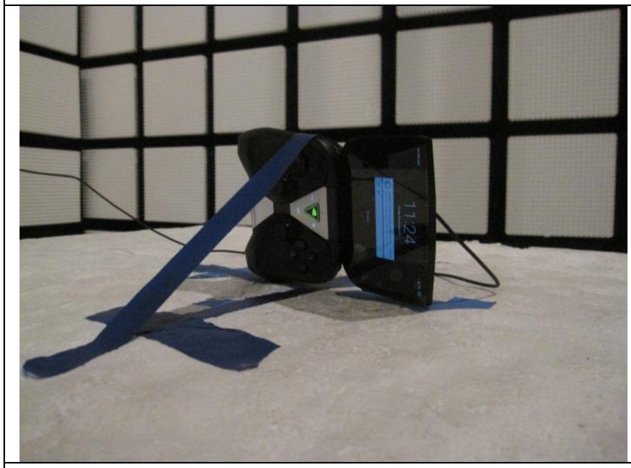
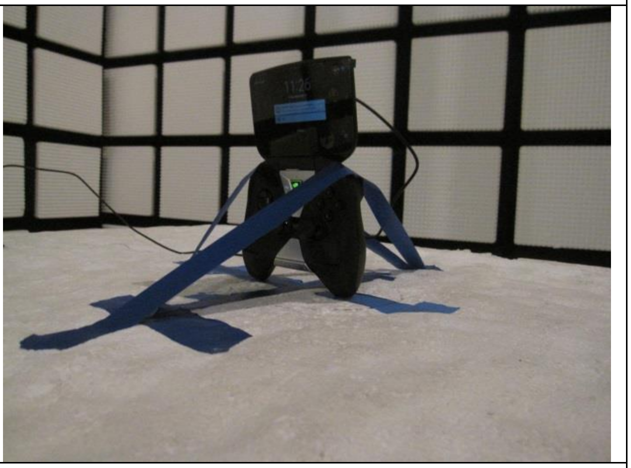
Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2 (dB)	LC Cables 2&3 (dB)	Corrected Reading dBuV	CISPR 22 Class B QP	Margin to Limit (dB)	CISPR 22 Class B Avg	Margin to Limit (dB)
14	.1545	44.28	PK	1.4	0	45.68	65.8	-20.12	-	-
15	.1545	22.64	Av	1.4	0	24.04	-	-	55.8	-31.76
16	.411	36.63	PK	.4	0	37.03	57.6	-20.57	-	-
17	.411	17.06	Av	.4	0	17.46	-	-	47.6	-30.14
18	1.2795	37.86	PK	.2	.1	38.16	56	-17.84	-	-
19	1.2795	19.12	Av	.2	.1	19.42	-	-	46	-26.58
20	8.7	38.43	PK	.2	.1	38.73	60	-21.27	-	-
21	8.7	25.01	Av	.2	.1	25.31	-	-	50	-24.69

12. SETUP PHOTOS

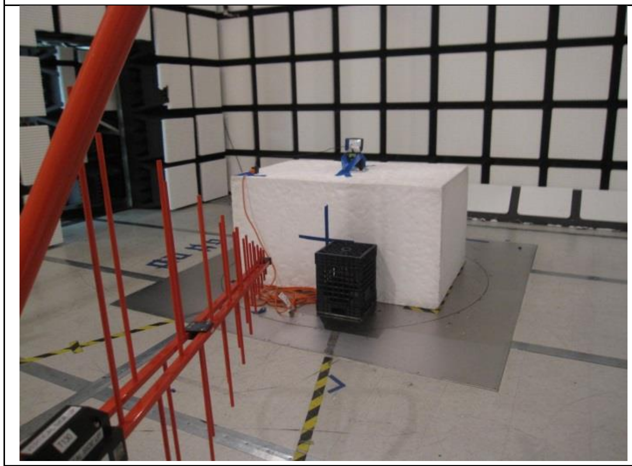
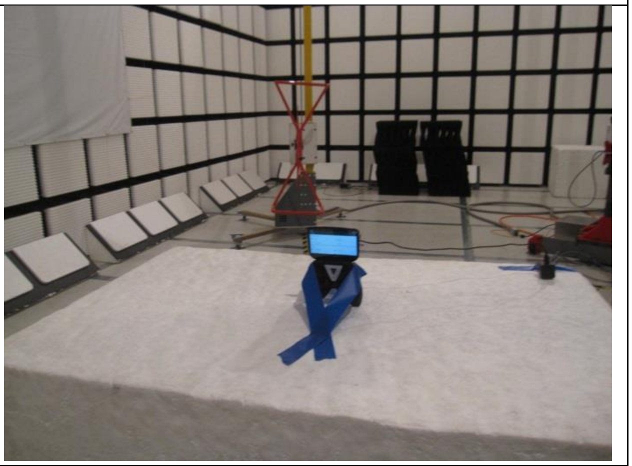
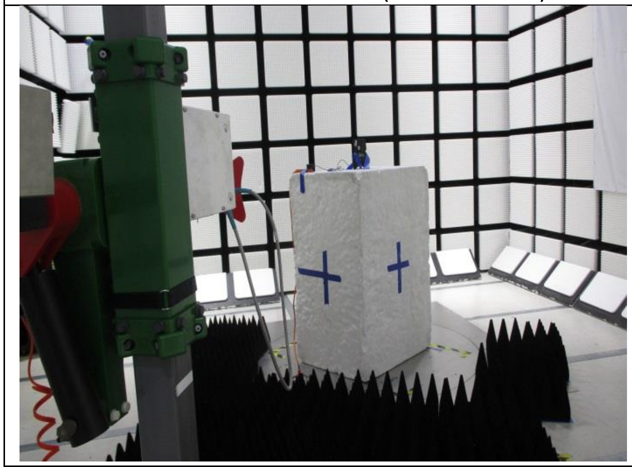
RADIATED AND POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP	
	
RADIATED FRONT PHOTO (BELOW 1 GHz)	RADIATED BACK PHOTO (BELOW 1 GHz)
	
RADIATED FRONT PHOTO (ABOVE 1 GHz)	RADIATED BACK PHOTO (ABOVE 1 GHz)
	
LINE CONDUCTED FRONT PHOTO	LINE CONDUCTED SIDE VIEW PHOTO

ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP AND RADIATED RF MEASUREMENT SETUP FOR PORTABLE CONFIGURATION

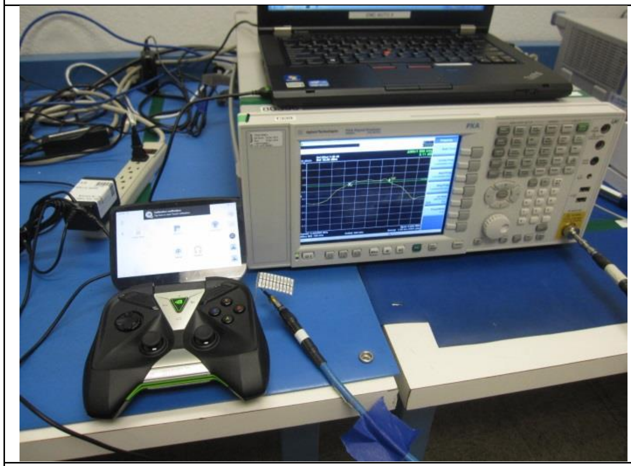
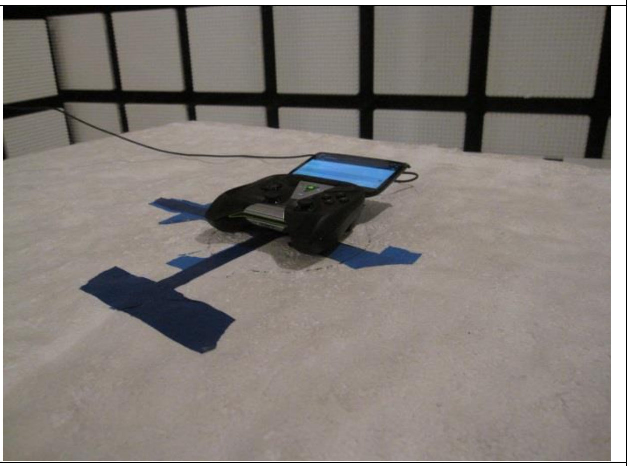
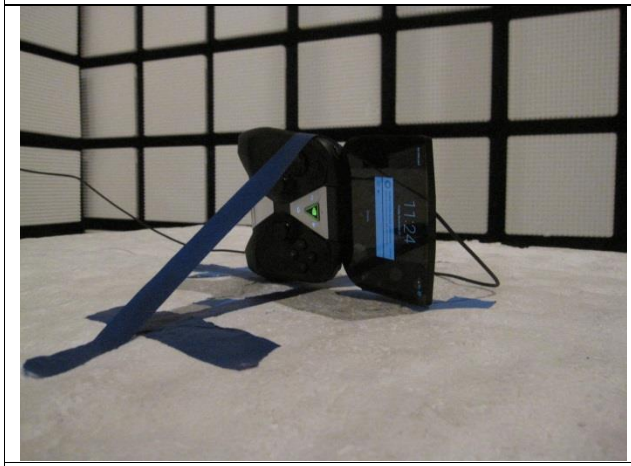
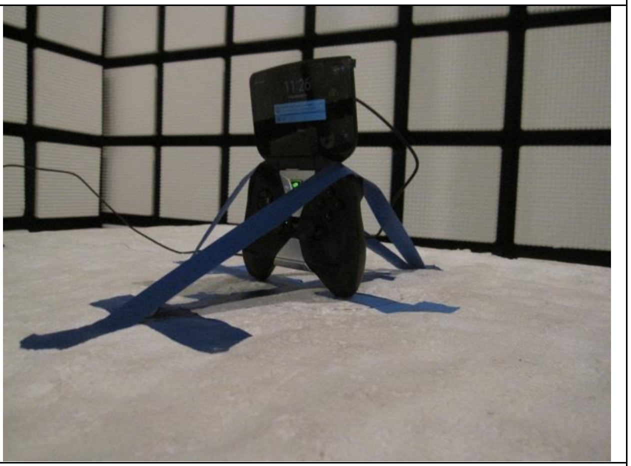
	
ANTENNA PORT CONDUCTED PHOTO	X-AXIS FRONT PHOTO
	
Y-AXIS FRONT PHOTO	Z-AXIS FRONT PHOTO

END OF REPORT

16. SETUP PHOTOS

RADIATED AND POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP	
	
RADIATED FRONT PHOTO (BELOW 1 GHz)	RADIATED BACK PHOTO (BELOW 1 GHz)
	
RADIATED FRONT PHOTO (ABOVE 1 GHz)	RADIATED BACK PHOTO (ABOVE 1 GHz)
LINE CONDUCTED FRONT PHOTO	LINE CONDUCTED SIDE VIEW PHOTO

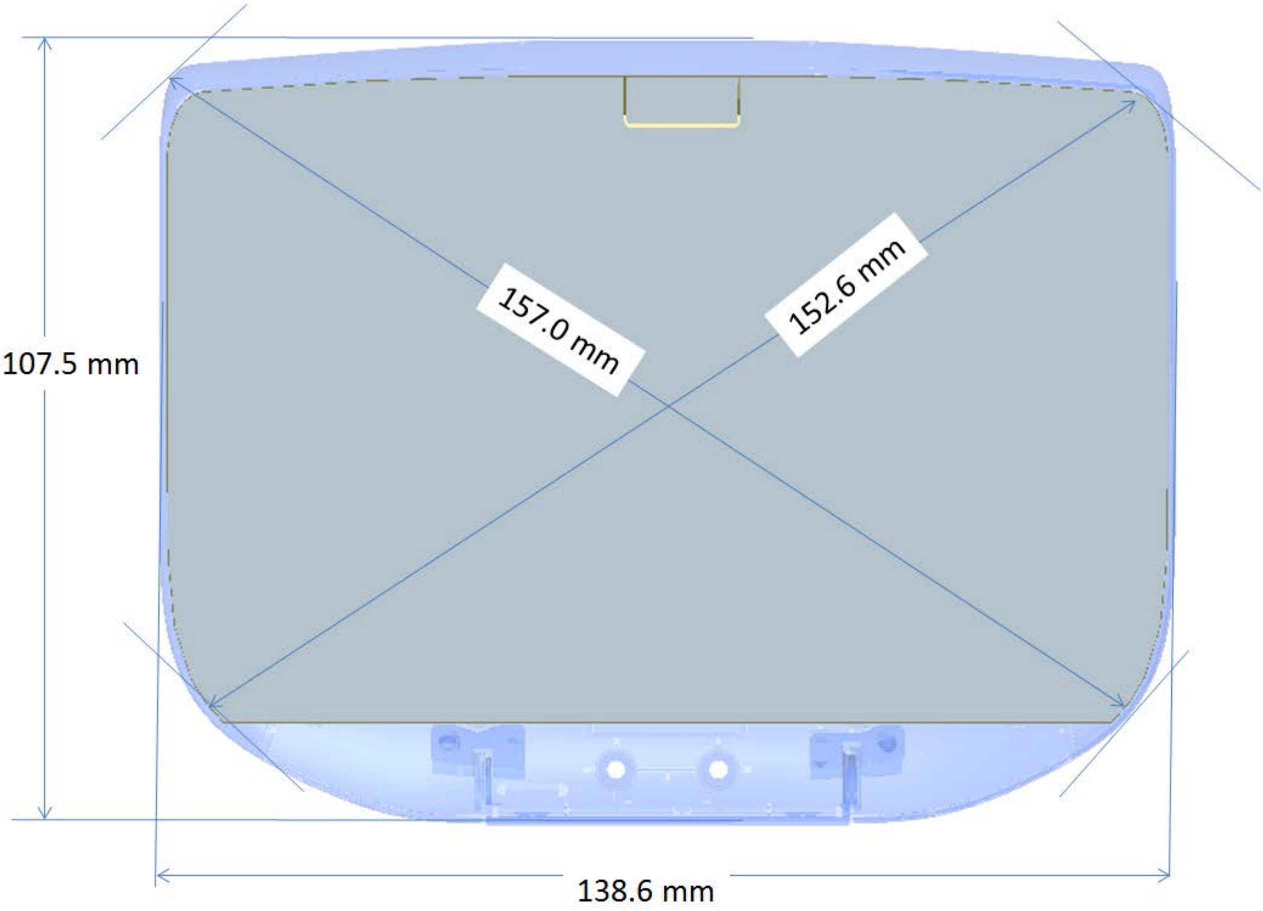
ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP AND RADIATED RF MEASUREMENT SETUP FOR PORTABLE CONFIGURATION

	
ANTENNA PORT CONDUCTED PHOTO	X-AXIS FRONT PHOTO
	
Y-AXIS FRONT PHOTO	Z-AXIS FRONT PHOTO

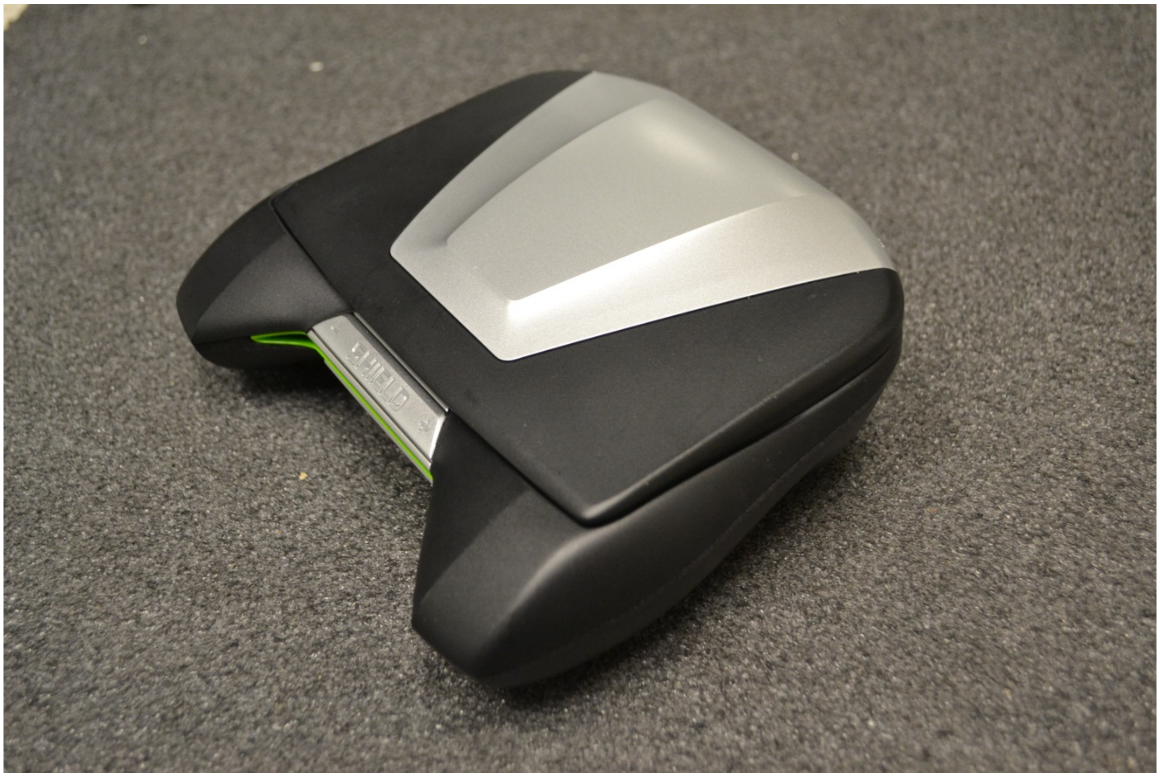
END OF REPORT

DUT and SAR Set-up Photos

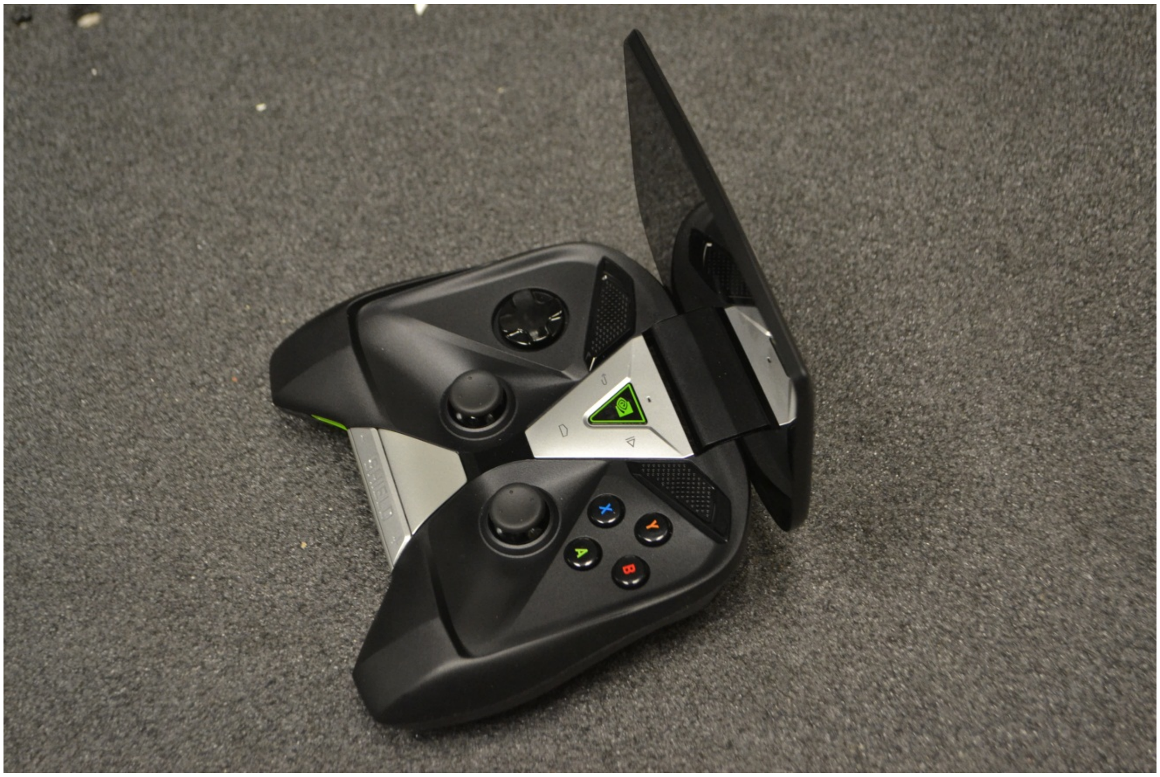
Overall Dimensions



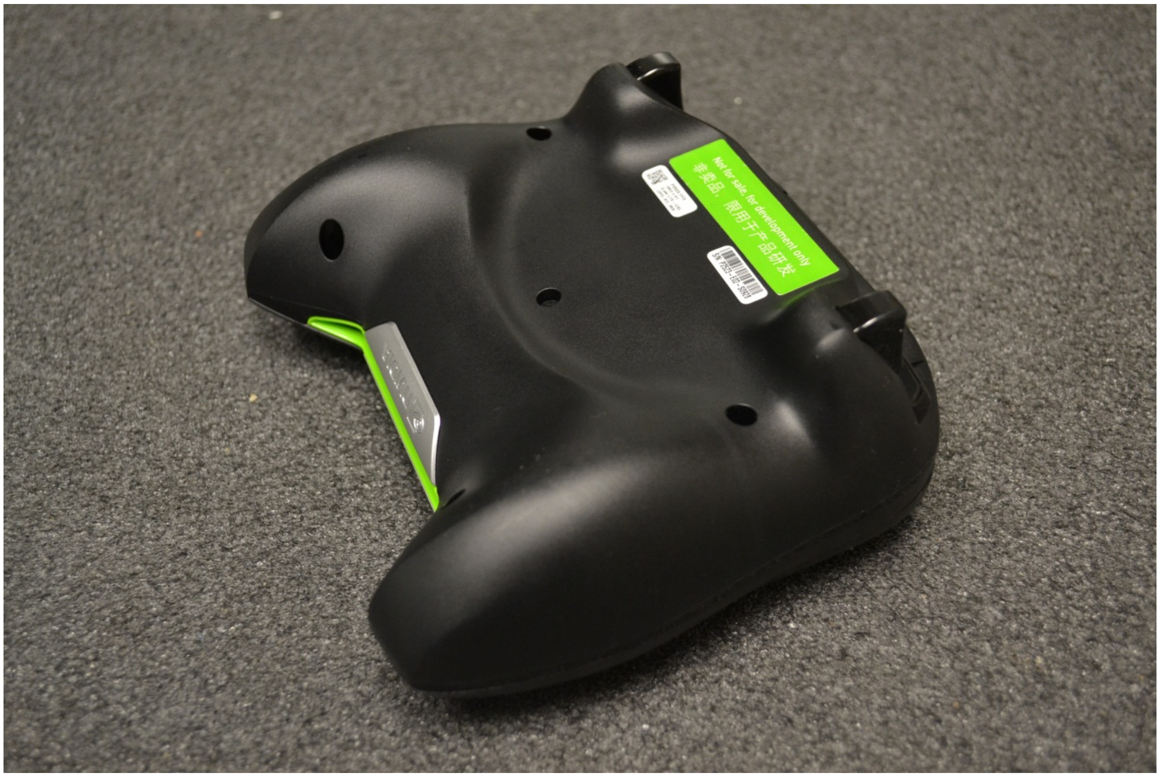
Front View of the DUT Closed



Front View of the DUT Open

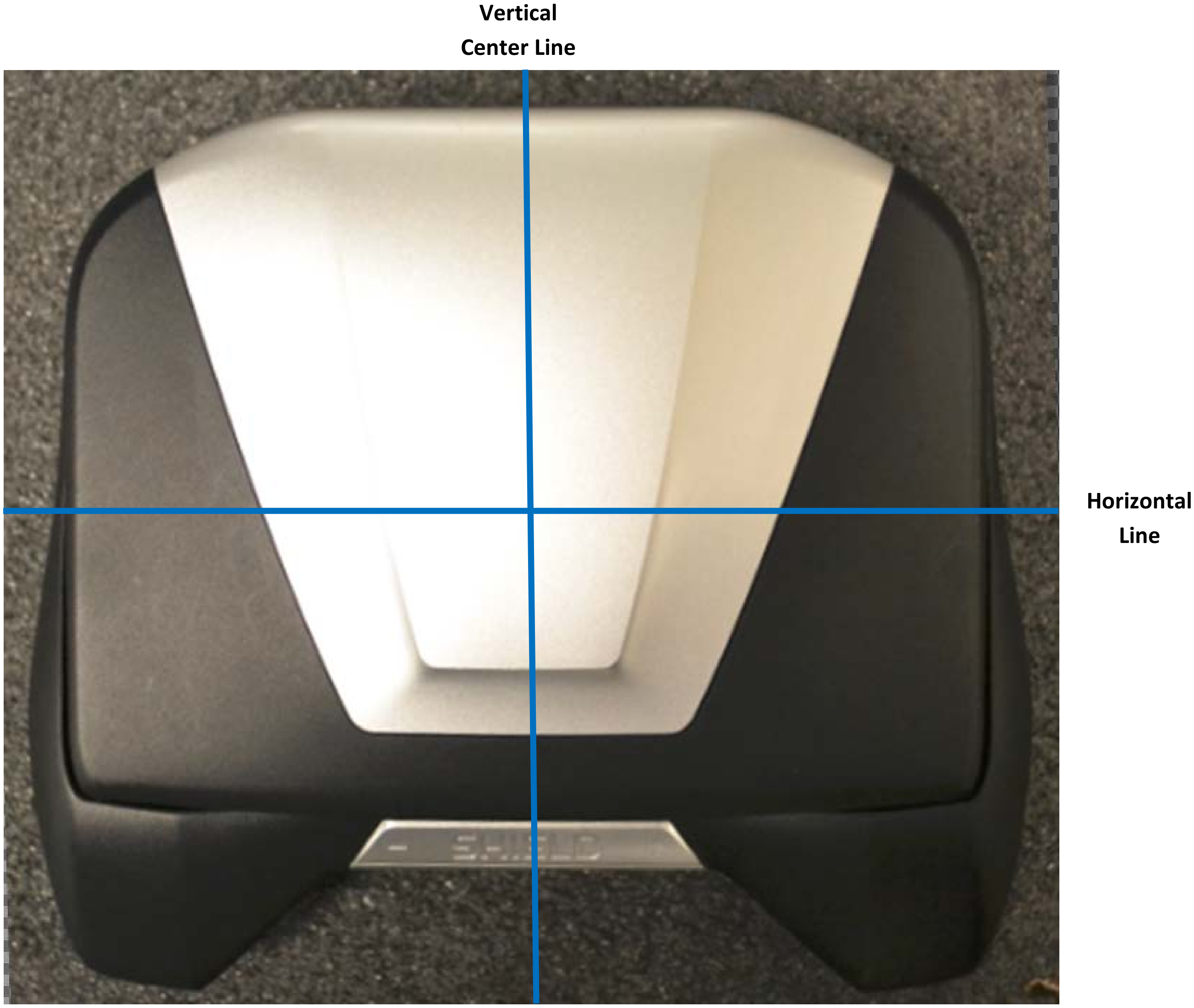


Rear View of the DUT



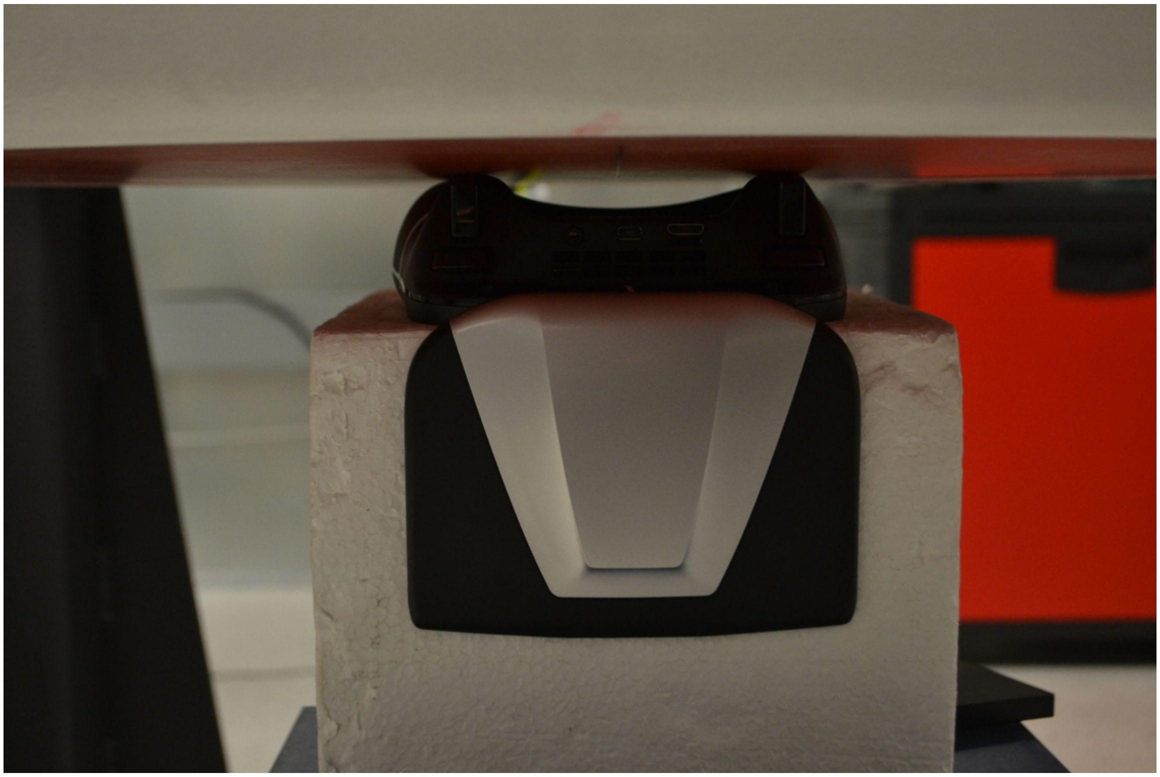
Setup Photos

Handset Vertical and Horizontal Reference Lines

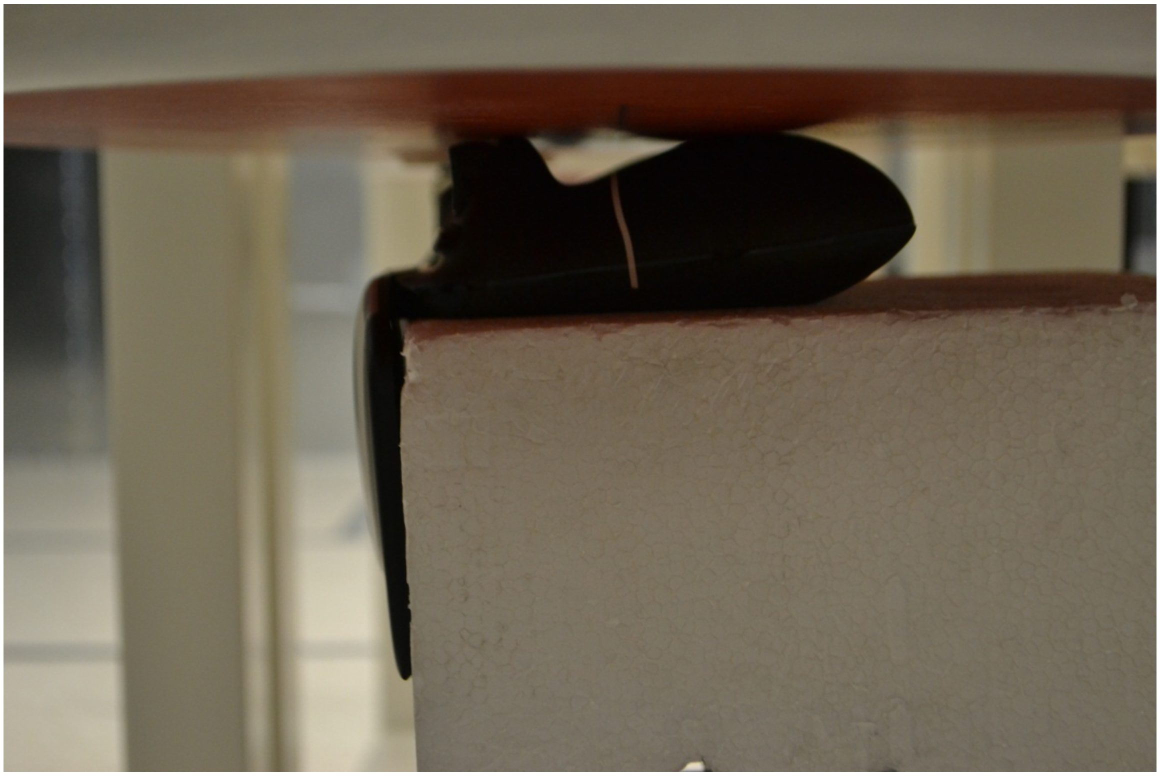


Body-worn Accessory & Hotspot mode Exposure Conditions

Rear



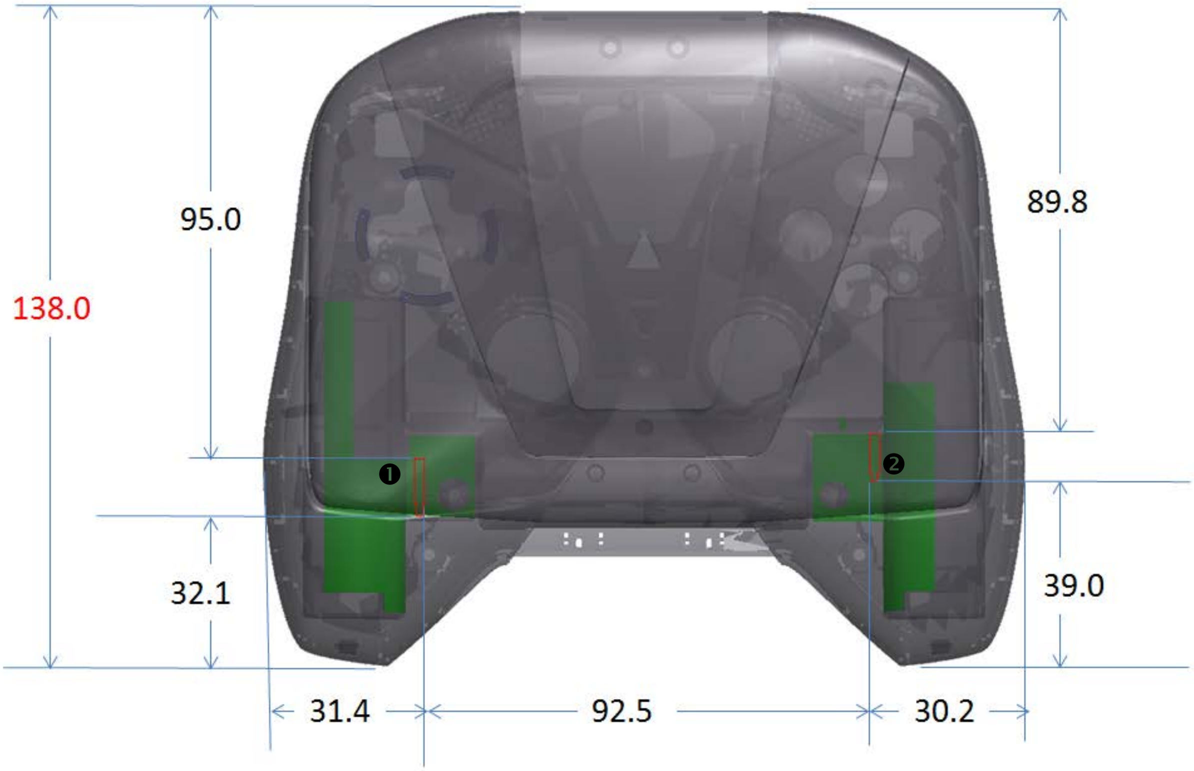
Rear – Side View

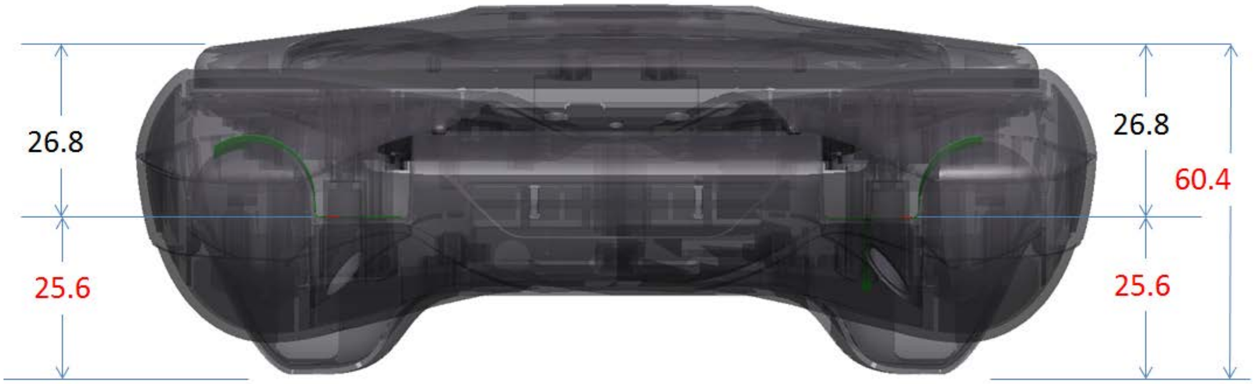


① Wi-Fi / BT Ant (TX & RX)

Antenna Dimensions & Separation Distances

② Wi-Fi Ant 2 (Tx & Rx)





FCC 47 CFR PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

PORTABLE GAMING DEVICE

MODEL NUMBER: P2523

FCC ID: VOB-P2523

REPORT NUMBER: 14U19497-E7V2

ISSUE DATE: JULY 12, 2016

Prepared for
NVIDIA
2701 SAN TOMAS EXPY
SANTA CLARA, CA 95050

Prepared by
UL VERIFICATION SERVICES INC.
47173 BENICIA STREET
FREMONT, CA 94538, U.S.A.
TEL: (510) 771-1000
FAX: (510) 661-0888

NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	6/20/16	Initial Issue	D. Coronia
V1	7/12/16	Updated Section 6, added note on Section 10.3.1-10.3.4 & 11.1.1-11.1.2	D. Coronia

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS 5

2. TEST METHODOLOGY 6

3. FACILITIES AND ACCREDITATION 6

4. CALIBRATION AND UNCERTAINTY 6

4.1. MEASURING INSTRUMENT CALIBRATION 6
4.2. SAMPLE CALCULATION 6
4.3. MEASUREMENT UNCERTAINTY 7

5. EQUIPMENT UNDER TEST 8

5.1. DESCRIPTION OF EUT 8
5.2. MAXIMUM OUTPUT POWER 8
5.3. DESCRIPTION OF AVAILABLE ANTENNAS 8
5.4. WORST-CASE CONFIGURATION AND MODE 10
5.5. DESCRIPTION OF TEST SETUP 11

6. TEST AND MEASUREMENT EQUIPMENT 13

7. MEASUREMENT METHODS 14

8. SUMMARY TABLE 15

9. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS 16

10. ANTENNA PORT TEST RESULTS SISO 802.11b/g Chain 0 and 1 17

10.1. 6 dB BANDWIDTH 17
10.1.1. 6 dB BANDWIDTH PLOTS AND TABLE 18

10.2. 99% BANDWIDTH 22
10.2.1. 99% BANDWIDTH PLOTS AND TABLE 23

10.3. OUTPUT POWER 27
10.3.1. 802.11b MODE IN THE 2.4 GHz BAND (Chain 0) 28
10.3.2. 802.11b MODE IN THE 2.4 GHz BAND (Chain 1) 29
10.3.3. 802.11g MODE IN THE 2.4 GHz BAND (Chain 0) 30
10.3.4. 802.11g MODE IN THE 2.4 GHz BAND (Chain1) 31

10.4. POWER SPECTRAL DENSITY 32
10.4.1. POWER SPECTRAL DENSITY PLOTS AND TABLE 33

10.5. CONDUCTED SPURIOUS AND OUT-OF-BAND EMISSIONS 37
10.5.1. BANDEDGE AND SPURIOUS EMISSIONS PLOTS 38

11. ANTENNA PORT TEST RESULTS MIMO 802.11n Mode 42

11.1. 6 dB BANDWIDTH 42
11.1.1. 6 dB BANDWIDTH PLOTS AND TABLE 43

11.2. 99% BANDWIDTH 45
11.2.1. 99% BANDWIDTH PLOTS AND TABLE 46

11.1. OUTPUT POWER 48
11.1.1. 802.11n HT20 MODE IN THE 2.4 GHz BAND 49
11.1.2. 802.11n HT40 MODE IN THE 2.4 GHz BAND 50

11.2. POWER SPECTRAL DENSITY 51
11.2.1. POWER SPECTRAL DENSITY PLOTS AND TABLE 52

11.3. CONDUCTED SPURIOUS AND OUT-OF-BAND EMISSIONS 54
11.3.1. BANDEDGE AND SPURIOUS EMISSIONS PLOTS 55

12. RADIATED TEST RESULTS SISO 802.11b/g Chain 0 57

12.1. LIMITS AND PROCEDURE 57

12.2. TRANSMITTER ABOVE 1 GHz 58
12.2.1. TX ABOVE 1 GHz 802.11b MODE IN THE 2.4 GHz BAND 58
12.2.2. TX ABOVE 1 GHz 802.11g MODE IN THE 2.4 GHz BAND 71

13. RADIATED TEST RESULTS SISO 802.11b/g Chain 1 84

13.1. TRANSMITTER ABOVE 1 GHz 84
13.1.1. TX ABOVE 1 GHz 802.11b MODE IN THE 2.4 GHz BAND 84
13.1.2. TX ABOVE 1 GHz 802.11g MODE IN THE 2.4 GHz BAND 97

14. RADIATED TEST RESULTS MIMO 802.11n Mode 110

14.1. LIMITS AND PROCEDURE 110

14.2. TRANSMITTER ABOVE 1 GHz 111
14.2.1. TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 2.4 GHz BAND 111
1.1.1. TX ABOVE 1 GHz 802.11n HT40 MODE IN THE 2.4 GHz BAND 124

1.2. TRANSMITTER BELOW 1 GHz 137

15. AC POWER LINE CONDUCTED EMISSIONS 139

16. SETUP PHOTOS 144

1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	NVIDIA
EUT DESCRIPTION:	Portable Gaming Device
MODEL:	P2523
SERIAL NUMBER:	P2523-E02-S0929
DATE TESTED:	NOVEMBER 21-DECEMBER 8, 2014

APPLICABLE STANDARDS

STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For UL Verification Services Inc. By:	Tested By:
DAN CORONIA CONSUMER TECHNOLOGY DIVISION WiSE PROJECT LEAD UL VERIFICATION SERVICES INC	KIYA KEDIDA CONSUMER TECHNOLOGY DIVISION WiSE LAB ENGINEER UL VERIFICATION SERVICES INC

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, FCC CFR 47 Part 2, FCC CFR 47 Part 15, FCC KDB 662911.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, Fremont, California, USA. Line conducted emissions are measured only at the 47173 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

47173 Benicia Street	47266 Benicia Street
☐ Chamber A(IC: 2324B-1)	☐ Chamber D(IC: 2324B-4)
☒ Chamber B(IC: 2324B-2)	☐ Chamber E(IC: 2324B-5)
☒ Chamber C(IC: 2324B-3)	☐ Chamber F(IC: 2324B-6)
	☐ Chamber G(IC: 2324B-7)
	☐ Chamber H(IC: 2324B-8)

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers A through H are covered under Industry Canada company address code 2324B with site numbers 2324B -1 through 2324B-8, respectively.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://ts.nist.gov/standards/scopes/2000650.htm.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 9KHz to 30 MHz	2.14 dB
Radiated Disturbance, 30 to 1000 MHz	4.98 dB
Radiated Disturbance,1000 to 6000 MHz	3.86 dB
Radiated Disturbance,6000 to 18000 MHz	4.23 dB
Radiated Disturbance,18000 to 26000 MHz	5.30 dB
Radiated Disturbance,26000 to 40000 MHz	5.23 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a Portable Gaming Device.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum total conducted output power as follows:

Frequency Range (MHz)	Mode	Total Output Power (dBm)	Total Output Power (mW)
2412 - 2462	802.11b	18.8	75.86
2412 - 2462	802.11g	19.6	92.04
2412 - 2462	802.11n HT20	20.6	115.08
2422 - 2452	802.11n HT40	16.4	43.75

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antenna for the 802.11b/g, 802.11n HT20/HT40 modes with maximum peak gains as described below:

Frequency (MHz)	Antenna Gain (dBi)	
	Core0	Core1
2.4	3.36	0.85

List of test reduction and modes covering other modes:

2400 - 2483.5 MHz Authorized Frequency Band (Antenna Port & Radiated Testing)		
Frequency Range (MHz)	**Mode**	**Covered by**
2412 - 2462	802.11b Legacy 1TX	802.11b CDD 2TX
2412 - 2462	802.11g Legacy 1TX	802.11g CDD 2TX
2412 - 2462	802.11n 1TX	802.11n HT20 CDD 2TX
2412 - 2462	802.11n STBC 2TX	802.11n HT20 CDD 2TX
2422 - 2452	802.11n HT40 1TX	802.11n HT40 CDD 2TX
2422 - 2452	802.11n HT40 STBC 2TX	802.11n HT40 CDD 2TX

5.4. WORST-CASE CONFIGURATION AND MODE

Radiated emission and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

The fundamental of the EUT was investigated in three orthogonal orientations X, Y, Z it was determined that Z orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Z orientation.

Based on the baseline scan, the worst-case data rates were:

802.11b mode: 1 Mbps
802.11g mode: 6 Mbps
802.11n HT20mode: MCS0
802.11n HT40mode: MCS0

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
AC Adapter	NVIDIA	SPA011AU5W	R43001	N/A

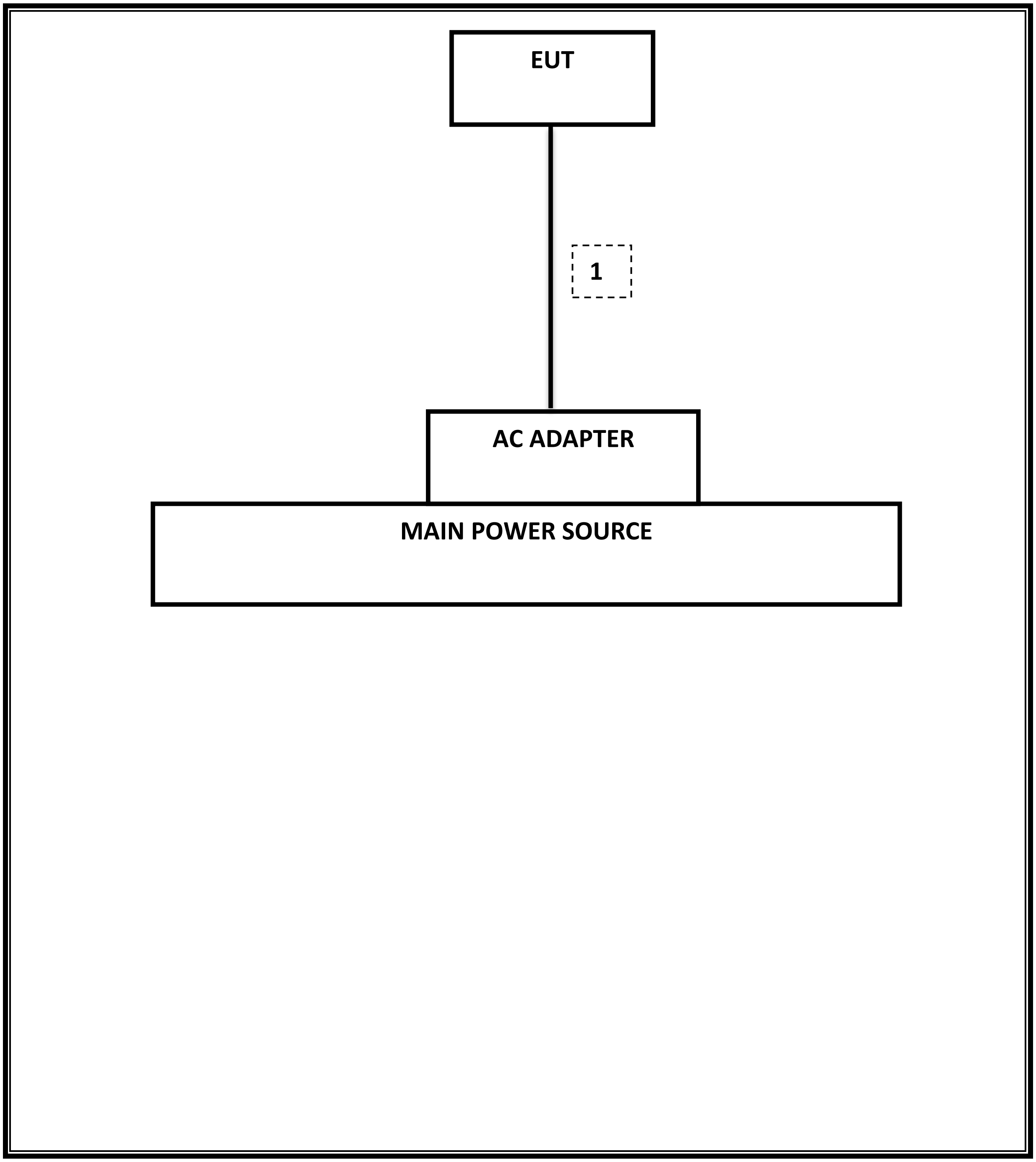
I/O CABLES

Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	Mini USB	Shielded	1.2m	N/A

TEST SETUP

The EUT is a stand-alone unit during the tests. Test software exercised the radio card.

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment List				
Description	**Manufacturer**	**Model**	**Asset**	**Cal Due**
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	12/20/14
Spectrum Analyzer,9KHz-40GHz	HP	8564E	C00986	04/01/15
EMI Test Receiver, 9 kHz-7 GHz	R & S	ESCI 7	100773	08/15/15
Peak Power Meter	Agilent / HP	E4416A	C00963	12/13/14
Peak / Average Power Sensor	Agilent / HP	E9327A	C00964	12/13/14
Antenna, Horn, 1-18 GHz	ETS	3117	C01022	02/21/15
Antenna, Horn,18- 26 GHz	ARA	MWH-1826/B	C00946	11/12/15
Antenna, Horn, 26-40 GHz	ARA	MWH-2640	C00891	06/28/15
Antenna, Bilog, 30MHz-1 GHz	Sunol Sciences	JB1	T243	03/06/15
RF Preamplifier, 100KHz -> 1300MHz	HP	TBD	C00825	06/01/15
RF Preamplifier, 1GHz - 18GHz	Miteq	NSP4000-SP2	924343	03/23/15
RF Preamplifier, 1GHz - 26.5GHz	HP	8449B	F00351	06/27/15
AC Power Supply, 2,500VA 45-500Hz	Elgar-Ametek	CW2501M	F00013	CNR
RF Preamplifier, 1GHz - 18GHz	Miteq	AFS42-00101800-25-S-42	1818466	05/09/15
Attenuator / Switch driver	HP	11713A	F00204	CNR
Low Pass Filter 3GHz	Micro-Tronics	LPS17541	F00219	05/23/15
High Pass Filter 5GHz	Micro-Tronics	HPS17542	F00222	05/22/15
High Pass Filter 6GHz	Micro-Tronics	HPM17543	F00224	05/22/15

Test Software List			
Description	**Manufacturer**	**Model**	**Version**
Radiated Software	UL	UL EMC	Version 9.5, 07/22/14
Conducted Software	UL	UL EMC	Version 9.5, 05/17/14
Antenna Port Software	UL	UL RF	Version 2.1.1.1, 1/20/15

7. MEASUREMENT METHODS

On Time and Duty Cycle: KDB 558074 D01 v03r05, Section 6.

6 dB Emission BW: KDB 558074 D01 v03r05, Section 8.

99% BW: ANSI C63.10-2013, Section 6.9.3.

Conducted Output Power: KDB 558074 D01 v03r05, Section 9.2.3.1 (Method AVGPM-G).

Power Spectral Density: KDB 558074 D01 v03r05, Section 10.3 (Method AVGPSD-1).

Unwanted emissions in restricted bands: KDB 558074 D01 v03r05, Section 12.0, 12.2.

Unwanted emissions in non-restricted bands: KDB 558074 D01 v03r05, Section 11.1, 11.2, and 11.3

AC Power Line Conducted Emissions: ANSI C63.10-2013, Section 6.2.

8. SUMMARY TABLE

FCC Part Section	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result
15.247 (a)(2)	RSS-247 5.2.1	Occupied Band width (6dB)	>500KHz	Conducted	Pass
2.1051, 15.247 (d)	RSS-247 5.5	Band Edge / Conducted Spurious Emission	-20dBc		Pass
15.247	RSS-247 5.4.4	TX conducted output power	<30dBm		Pass
15.247	RSS-247 5.2.2	PSD	<8dBm		Pass
15.207 (a)	RSS-GEN 8.8	AC Power Line conducted emissions	Section 10	Radiated	Pass
15.205, 15.209	RSS-GEN 8.9/7	Radiated Spurious Emission	< 54dBuV/m		Pass

9. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS

LIMITS

None; for reporting purposes only.

PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

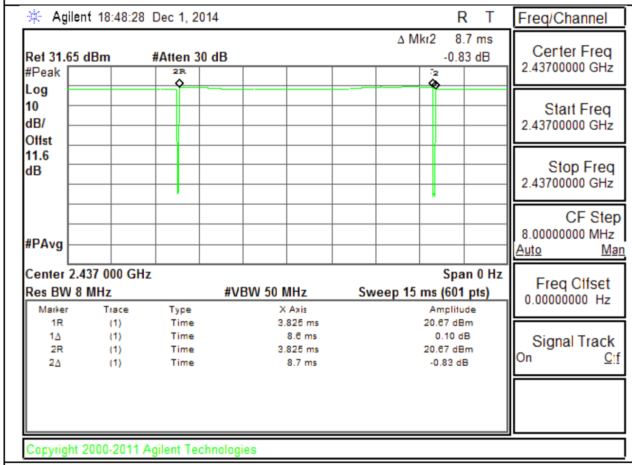
9.1.1. ON TIME AND DUTY CYCLE RESULTS

ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/T Minimum VBW (kHz)
802.11b	8.60	8.7	0.989	98.9%	0.00	0.010
802.11g	1.43	1.5	0.935	93.5%	0.29	0.699
802.11n HT20	1.34	1.4	0.931	93.1%	0.31	0.747
802.11n HT40	0.94	1.0	0.969	96.9%	0.14	1.059

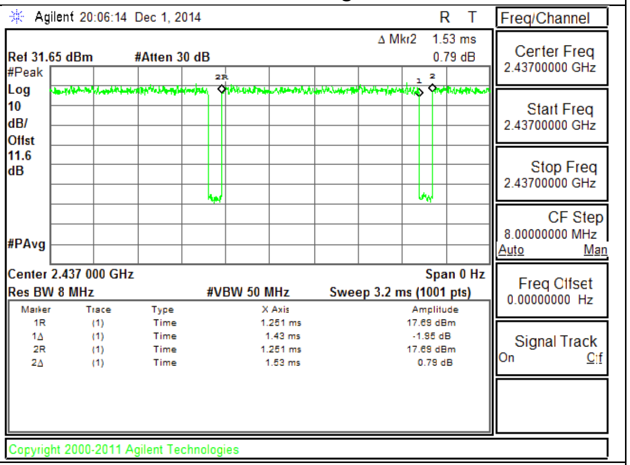
DUTY CYCLE PLOTS

802.11b


Agilent 18:48:28 Dec 1, 2014
R T
Δ Mkr2 8.7 ms
Ref 31.65 dBm #Atten 30 dB -0.83 dB
#Peak
Log
10
dB/
Offst
11.6
dB
#PAvg
2R
2
Center 2.437 000 GHz Span 0 Hz
Res BW 8 MHz #VBW 50 MHz Sweep 15 ms (601 pts)
Freq/Channel
Center Freq 2.43700000 GHz
Start Freq 2.43700000 GHz
Stop Freq 2.43700000 GHz
CF Step 8.00000000 MHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off
Copyright 2000-2011 Agilent Technologies

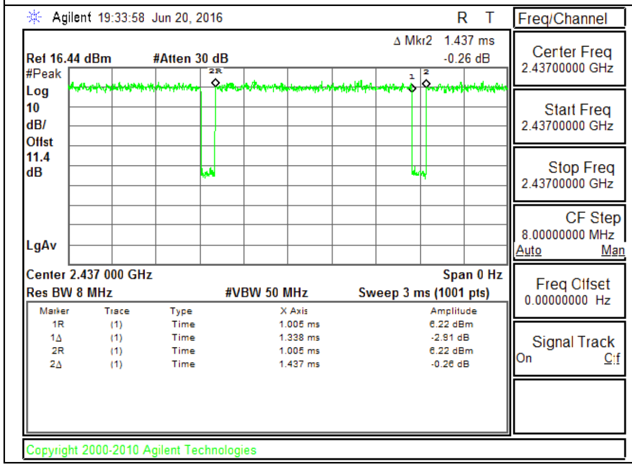
Marker	Trace	Type	X Axis	Amplitude
1R	(1)	Time	3.825 ms	20.67 dBm
1Δ	(1)	Time	8.6 ms	0.10 dB
2R	(1)	Time	3.825 ms	20.67 dBm
2Δ	(1)	Time	8.7 ms	-0.83 dB

802.11g


Agilent 20:06:14 Dec 1, 2014
R T
Δ Mkr2 1.53 ms
Ref 31.65 dBm #Atten 30 dB 0.79 dB
#Peak
Log
10
dB/
Offst
11.6
dB
#PAvg
2R
1
2
Center 2.437 000 GHz Span 0 Hz
Res BW 8 MHz #VBW 50 MHz Sweep 3.2 ms (1001 pts)
Freq/Channel
Center Freq 2.43700000 GHz
Start Freq 2.43700000 GHz
Stop Freq 2.43700000 GHz
CF Step 8.00000000 MHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off
Copyright 2000-2011 Agilent Technologies

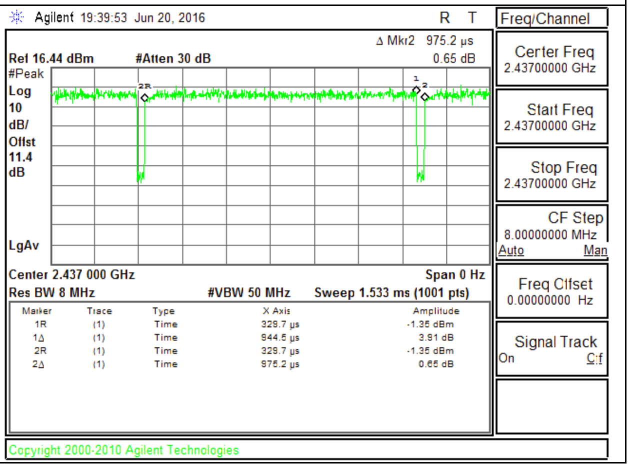
Marker	Trace	Type	X Axis	Amplitude
1R	(1)	Time	1.251 ms	17.69 dBm
1Δ	(1)	Time	1.43 ms	-1.95 dB
2R	(1)	Time	1.251 ms	17.69 dBm
2Δ	(1)	Time	1.53 ms	0.79 dB

802.11n HT20


Agilent 19:33:58 Jun 20, 2016
R T
Δ Mkr2 1.437 ms
Ref 16.44 dBm #Atten 30 dB -0.26 dB
#Peak
Log
10
dB/
Offst
11.4
dB
LgAv
2R
1
2
Center 2.437 000 GHz Span 0 Hz
Res BW 8 MHz #VBW 50 MHz Sweep 3 ms (1001 pts)
Freq/Channel
Center Freq 2.43700000 GHz
Start Freq 2.43700000 GHz
Stop Freq 2.43700000 GHz
CF Step 8.00000000 MHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off
Copyright 2000-2010 Agilent Technologies

Marker	Trace	Type	X Axis	Amplitude
1R	(1)	Time	1.005 ms	6.22 dBm
1Δ	(1)	Time	1.338 ms	-2.91 dB
2R	(1)	Time	1.005 ms	6.22 dBm
2Δ	(1)	Time	1.437 ms	-0.26 dB

802.11n HT40


Agilent 19:39:53 Jun 20, 2016
R T
Δ Mkr2 975.2 μs
Ref 16.44 dBm #Atten 30 dB 0.65 dB
#Peak
Log
10
dB/
Offst
11.4
dB
LgAv
2R
1
2
Center 2.437 000 GHz Span 0 Hz
Res BW 8 MHz #VBW 50 MHz Sweep 1.533 ms (1001 pts)
Freq/Channel
Center Freq 2.43700000 GHz
Start Freq 2.43700000 GHz
Stop Freq 2.43700000 GHz
CF Step 8.00000000 MHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off
Copyright 2000-2010 Agilent Technologies

Marker	Trace	Type	X Axis	Amplitude
1R	(1)	Time	329.7 μs	-1.35 dBm
1Δ	(1)	Time	944.5 μs	3.91 dB
2R	(1)	Time	329.7 μs	-1.35 dBm
2Δ	(1)	Time	975.2 μs	0.65 dB

10. ANTENNA PORT TEST RESULTS SISO 802.11b/g Chain 0 and 1

10.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

The minimum 6 dB bandwidth shall be at least 500 kHz.

TEST PROCEDURE

KDB 58074 D01 v03r05 Section 8.1

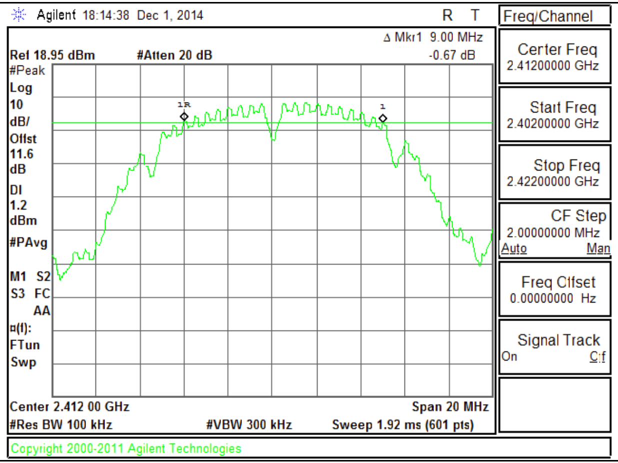
RESULTS

10.1.1. 6 dB BANDWIDTH PLOTS AND TABLE

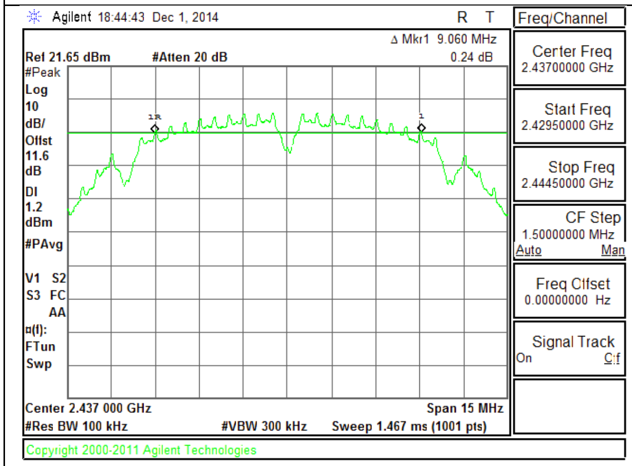
802.11b TEST RESULT TABLE (Chain 0)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	9.00	0.5
Middle	2437	9.06	0.5
High	2462	8.60	0.5

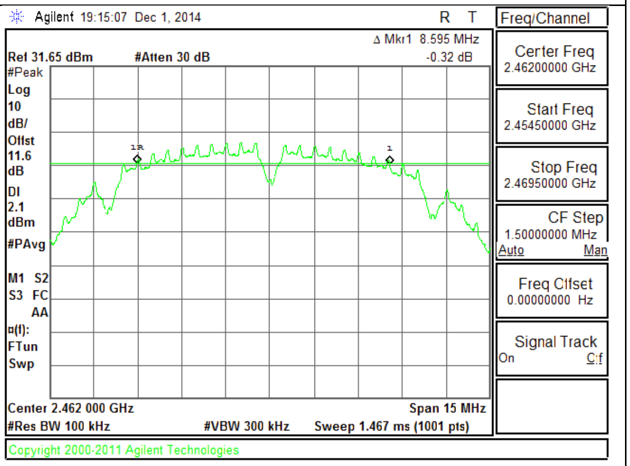
LOW CHANNEL


Agilent 18:14:38 Dec 1, 2014
R T
Freq/Channel
Δ Mkr1 9.00 MHz
Ref 18.95 dBm #Atten 20 dB -0.67 dB
#Peak
Log
10
dB/
Offst
11.6
dB
Dl
1.2
dBm
#PAvg
M1 S2
S3 FC
AA
£(f):
FTun
Swp
1R
1
Center 2.412 00 GHz Span 20 MHz
#Res BW 100 kHz #VBW 300 kHz Sweep 1.92 ms (601 pts)
Center Freq 2.41200000 GHz
Start Freq 2.40200000 GHz
Stop Freq 2.42200000 GHz
CF Step 2.00000000 MHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off
Copyright 2000-2011 Agilent Technologies

MID CHANNEL


Agilent 18:44:43 Dec 1, 2014
R T
Freq/Channel
Δ Mkr1 9.060 MHz
Ref 21.65 dBm #Atten 20 dB 0.24 dB
#Peak
Log
10
dB/
Offst
11.6
dB
Dl
1.2
dBm
#PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1R
1
Center 2.437 000 GHz Span 15 MHz
#Res BW 100 kHz #VBW 300 kHz Sweep 1.467 ms (1001 pts)
Center Freq 2.43700000 GHz
Start Freq 2.42950000 GHz
Stop Freq 2.44450000 GHz
CF Step 1.50000000 MHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off
Copyright 2000-2011 Agilent Technologies

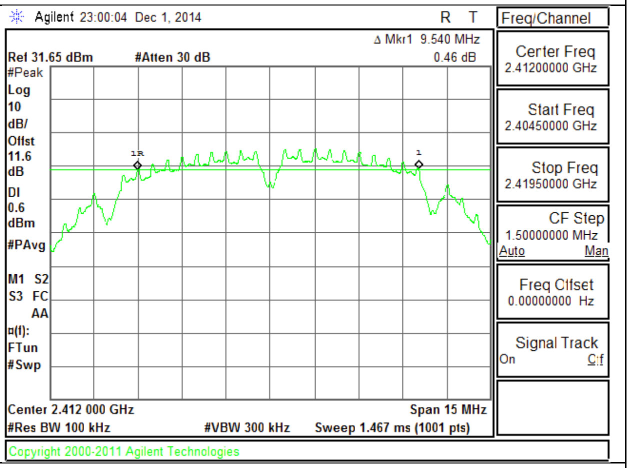
HIGH CHANNEL


Agilent 19:15:07 Dec 1, 2014
R T
Freq/Channel
Δ Mkr1 8.595 MHz
Ref 31.65 dBm #Atten 30 dB -0.32 dB
#Peak
Log
10
dB/
Offst
11.6
dB
Dl
2.1
dBm
#PAvg
M1 S2
S3 FC
AA
£(f):
FTun
Swp
1R
1
Center 2.462 000 GHz Span 15 MHz
#Res BW 100 kHz #VBW 300 kHz Sweep 1.467 ms (1001 pts)
Center Freq 2.46200000 GHz
Start Freq 2.45450000 GHz
Stop Freq 2.46950000 GHz
CF Step 1.50000000 MHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off
Copyright 2000-2011 Agilent Technologies

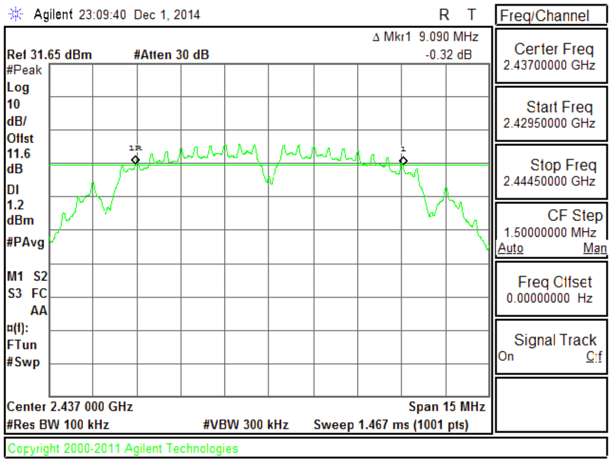
802.11b TEST RESULT TABLE (Chain 1)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	9.54	0.5
Middle	2437	9.01	0.5
High	2462	8.57	0.5

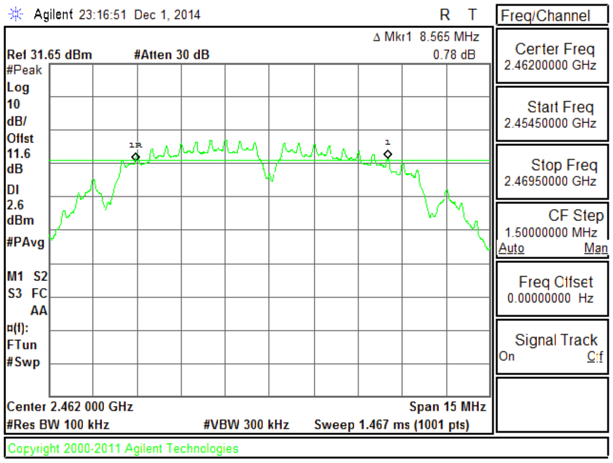
LOW CHANNEL


Agilent 23:00:04 Dec 1, 2014
Δ Mkr1 9.540 MHz
Ref 31.65 dBm #Atten 30 dB 0.46 dB
#Peak Log 10 dB/ Offst 11.6 dB
Dl 0.6 dBm
#PAvg
Center 2.412 000 GHz Span 15 MHz
#Res BW 100 kHz #VBW 300 kHz Sweep 1.467 ms (1001 pts)
Freq/Channel
Center Freq 2.41200000 GHz
Start Freq 2.40450000 GHz
Stop Freq 2.41950000 GHz
CF Step 1.50000000 MHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off

MID CHANNEL


Agilent 23:09:40 Dec 1, 2014
Δ Mkr1 9.090 MHz
Ref 31.65 dBm #Atten 30 dB -0.32 dB
#Peak Log 10 dB/ Offst 11.6 dB
Dl 1.2 dBm
#PAvg
Center 2.437 000 GHz Span 15 MHz
#Res BW 100 kHz #VBW 300 kHz Sweep 1.467 ms (1001 pts)
Freq/Channel
Center Freq 2.43700000 GHz
Start Freq 2.42950000 GHz
Stop Freq 2.44450000 GHz
CF Step 1.50000000 MHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off

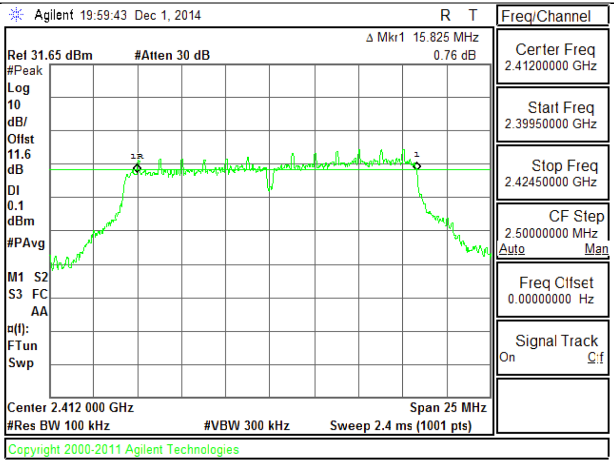
HIGH CHANNEL


Agilent 23:16:51 Dec 1, 2014
Δ Mkr1 8.565 MHz
Ref 31.65 dBm #Atten 30 dB 0.78 dB
#Peak Log 10 dB/ Offst 11.6 dB
Dl 2.6 dBm
#PAvg
Center 2.462 000 GHz Span 15 MHz
#Res BW 100 kHz #VBW 300 kHz Sweep 1.467 ms (1001 pts)
Freq/Channel
Center Freq 2.46200000 GHz
Start Freq 2.45450000 GHz
Stop Freq 2.46950000 GHz
CF Step 1.50000000 MHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off

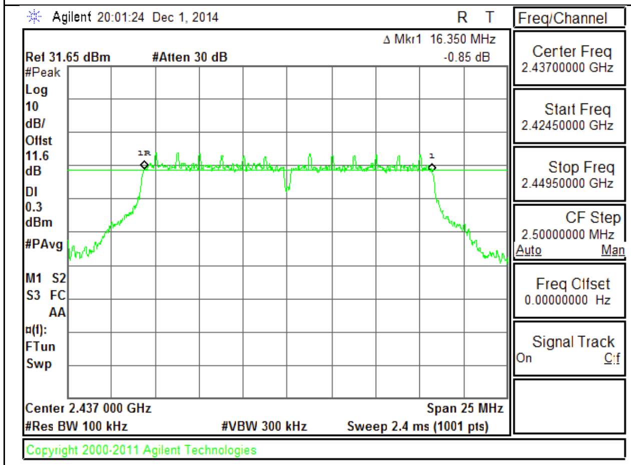
802.11g TEST RESULT TABLE (Chain 0)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	15.83	0.5
Middle	2437	16.35	0.5
High	2462	16.10	0.5

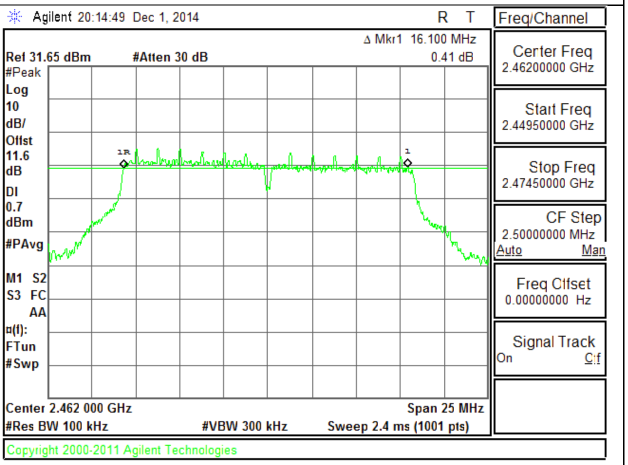
LOW CHANNEL


Agilent 19:59:43 Dec 1, 2014
R T
Freq/Channel
Δ Mkr1 15.825 MHz
Ref 31.65 dBm #Atten 30 dB 0.76 dB
#Peak
Log
10
dB/
Offst
11.6
dB
Dl
0.1
dBm
#PAvg
M1 S2
S3 FC
AA
£(f):
FTun
Swp
1R
1
Center 2.412 000 GHz Span 25 MHz
#Res BW 100 kHz #VBW 300 kHz Sweep 2.4 ms (1001 pts)
Center Freq 2.41200000 GHz
Start Freq 2.39950000 GHz
Stop Freq 2.42450000 GHz
CF Step 2.50000000 MHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off
Copyright 2000-2011 Agilent Technologies

MID CHANNEL


Agilent 20:01:24 Dec 1, 2014
R T
Freq/Channel
Δ Mkr1 16.350 MHz
Ref 31.65 dBm #Atten 30 dB -0.85 dB
#Peak
Log
10
dB/
Offst
11.6
dB
Dl
0.3
dBm
#PAvg
M1 S2
S3 FC
AA
£(f):
FTun
Swp
1R
1
Center 2.437 000 GHz Span 25 MHz
#Res BW 100 kHz #VBW 300 kHz Sweep 2.4 ms (1001 pts)
Center Freq 2.43700000 GHz
Start Freq 2.42450000 GHz
Stop Freq 2.44950000 GHz
CF Step 2.50000000 MHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off
Copyright 2000-2011 Agilent Technologies

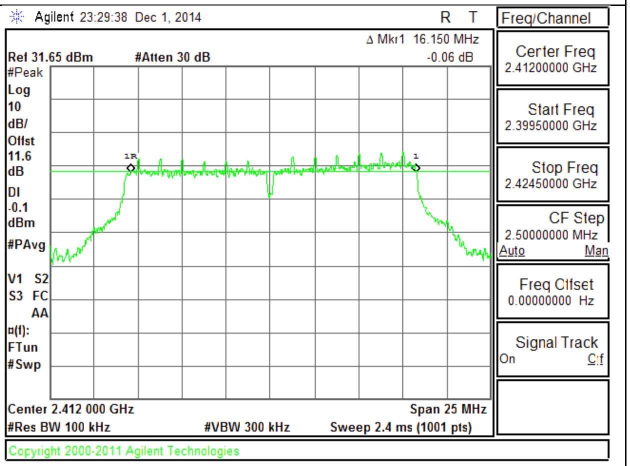
HIGH CHANNEL


Agilent 20:14:49 Dec 1, 2014
R T
Freq/Channel
Δ Mkr1 16.100 MHz
Ref 31.65 dBm #Atten 30 dB 0.41 dB
#Peak
Log
10
dB/
Offst
11.6
dB
Dl
0.7
dBm
#PAvg
M1 S2
S3 FC
AA
£(f):
FTun
#Swp
1R
1
Center 2.462 000 GHz Span 25 MHz
#Res BW 100 kHz #VBW 300 kHz Sweep 2.4 ms (1001 pts)
Center Freq 2.46200000 GHz
Start Freq 2.44950000 GHz
Stop Freq 2.47450000 GHz
CF Step 2.50000000 MHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off
Copyright 2000-2011 Agilent Technologies

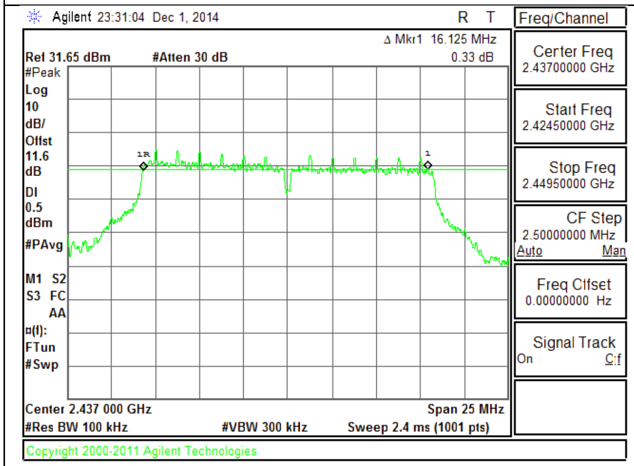
802.11g TEST RESULT TABLE (Chain 1)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	16.15	0.5
Middle	2437	16.13	0.5
High	2462	15.80	0.5

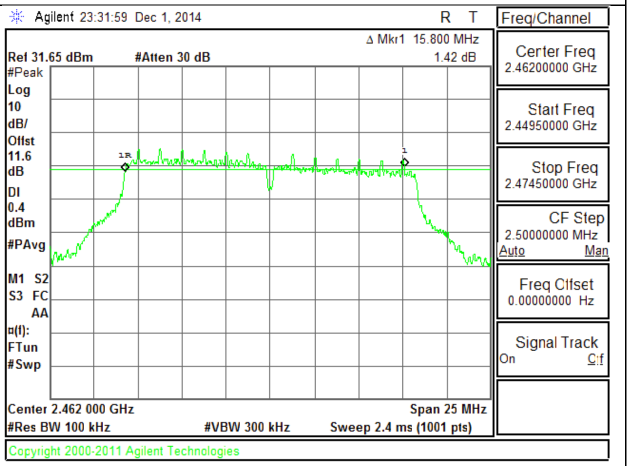
LOW CHANNEL


Agilent 23:29:38 Dec 1, 2014 R T
Δ Mkr1 16.150 MHz
Ref 31.65 dBm #Atten 30 dB -0.06 dB
#Peak Log 10 dB/ Offst 11.6 dB DI -0.1 dBm #PAvg V1 S2 S3 FC AA £(f): FTun #Swp
Center 2.412 000 GHz Span 25 MHz
#Res BW 100 kHz #VBW 300 kHz Sweep 2.4 ms (1001 pts)
Copyright 2000-2011 Agilent Technologies
Freq/Channel
Center Freq 2.41200000 GHz
Start Freq 2.39950000 GHz
Stop Freq 2.42450000 GHz
CF Step 2.50000000 MHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off

MID CHANNEL


Agilent 23:31:04 Dec 1, 2014 R T
Δ Mkr1 16.125 MHz
Ref 31.65 dBm #Atten 30 dB 0.33 dB
#Peak Log 10 dB/ Offst 11.6 dB DI 0.5 dBm #PAvg M1 S2 S3 FC AA £(f): FTun #Swp
Center 2.437 000 GHz Span 25 MHz
#Res BW 100 kHz #VBW 300 kHz Sweep 2.4 ms (1001 pts)
Copyright 2000-2011 Agilent Technologies
Freq/Channel
Center Freq 2.43700000 GHz
Start Freq 2.42450000 GHz
Stop Freq 2.44950000 GHz
CF Step 2.50000000 MHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off

HIGH CHANNEL


Agilent 23:31:59 Dec 1, 2014 R T
Δ Mkr1 15.800 MHz
Ref 31.65 dBm #Atten 30 dB 1.42 dB
#Peak Log 10 dB/ Offst 11.6 dB DI 0.4 dBm #PAvg M1 S2 S3 FC AA £(f): FTun #Swp
Center 2.462 000 GHz Span 25 MHz
#Res BW 100 kHz #VBW 300 kHz Sweep 2.4 ms (1001 pts)
Copyright 2000-2011 Agilent Technologies
Freq/Channel
Center Freq 2.46200000 GHz
Start Freq 2.44950000 GHz
Stop Freq 2.47450000 GHz
CF Step 2.50000000 MHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off

10.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

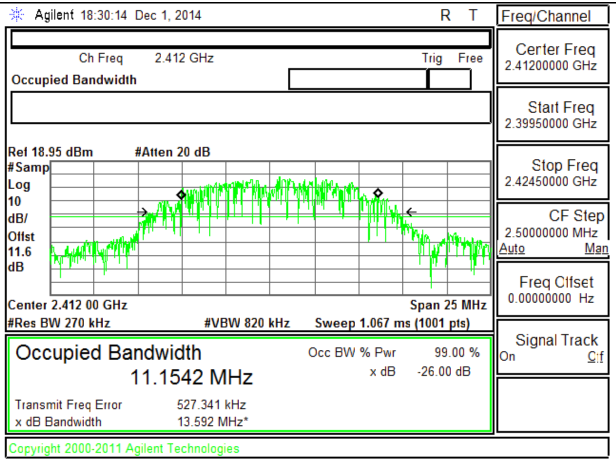
RESULTS

10.2.1. 99% BANDWIDTH PLOTS AND TABLE

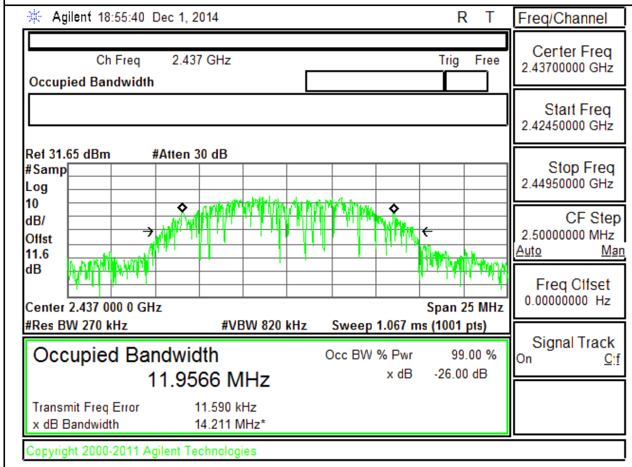
802.11b TEST RESULT TABLE (Chain 0)

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	11.15
Middle	2437	11.96
High	2462	11.25
Worst		11.96

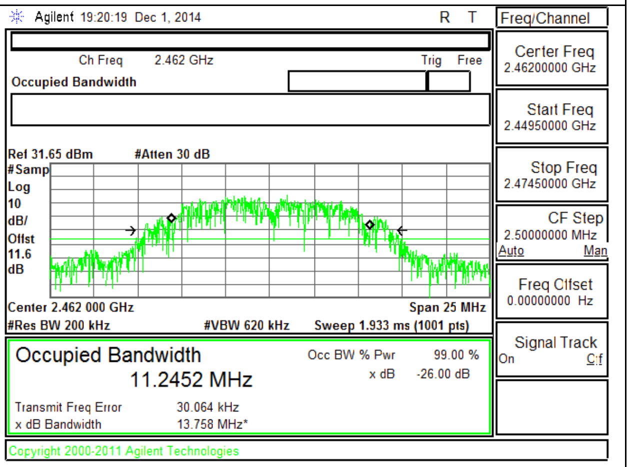
LOW CHANNEL


Agilent 18:30:14 Dec 1, 2014
Ch Freq 2.412 GHz Trig Free
Occupied Bandwidth
Ref 18.95 dBm #Atten 20 dB
Center 2.412 00 GHz Span 25 MHz
#Res BW 270 kHz #VBW 820 kHz Sweep 1.067 ms (1001 pts)
Occupied Bandwidth 11.1542 MHz
Occ BW % Pwr 99.00 %
x dB -26.00 dB
Transmit Freq Error 527.341 kHz
x dB Bandwidth 13.592 MHz*
Center Freq 2.41200000 GHz
Start Freq 2.39950000 GHz
Stop Freq 2.42450000 GHz
CF Step 2.50000000 MHz
Freq Offset 0.00000000 Hz

MID CHANNEL


Agilent 18:55:40 Dec 1, 2014
Ch Freq 2.437 GHz Trig Free
Occupied Bandwidth
Ref 31.65 dBm #Atten 30 dB
Center 2.437 000 0 GHz Span 25 MHz
#Res BW 270 kHz #VBW 820 kHz Sweep 1.067 ms (1001 pts)
Occupied Bandwidth 11.9566 MHz
Occ BW % Pwr 99.00 %
x dB -26.00 dB
Transmit Freq Error 11.590 kHz
x dB Bandwidth 14.211 MHz*
Center Freq 2.43700000 GHz
Start Freq 2.42450000 GHz
Stop Freq 2.44950000 GHz
CF Step 2.50000000 MHz
Freq Offset 0.00000000 Hz

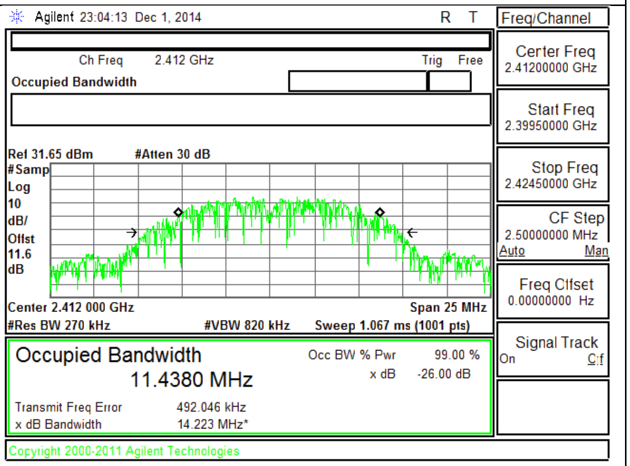
HIGH CHANNEL


Agilent 19:20:19 Dec 1, 2014
Ch Freq 2.462 GHz Trig Free
Occupied Bandwidth
Ref 31.65 dBm #Atten 30 dB
Center 2.462 000 GHz Span 25 MHz
#Res BW 200 kHz #VBW 620 kHz Sweep 1.933 ms (1001 pts)
Occupied Bandwidth 11.2452 MHz
Occ BW % Pwr 99.00 %
x dB -26.00 dB
Transmit Freq Error 30.064 kHz
x dB Bandwidth 13.758 MHz*
Center Freq 2.46200000 GHz
Start Freq 2.44950000 GHz
Stop Freq 2.47450000 GHz
CF Step 2.50000000 MHz
Freq Offset 0.00000000 Hz

802.11b TEST RESULT TABLE (Chain 1)

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	11.44
Middle	2437	11.78
High	2462	11.13
Worst		11.78

LOW CHANNEL



Agilent 23:04:13 Dec 1, 2014 R T

Ch Freq 2.412 GHz Trig Free

Occupied Bandwidth

Ref 31.65 dBm #Atten 30 dB

#Samp Log 10 dB/ Offst 11.6 dB

Center 2.412 000 GHz Span 25 MHz

#Res BW 270 kHz #VBW 820 kHz Sweep 1.067 ms (1001 pts)

Occupied Bandwidth 11.4380 MHz

Occ BW % Pwr 99.00 %

x dB -26.00 dB

Transmit Freq Error 492.046 kHz

x dB Bandwidth 14.223 MHz*

Freq/Channel

Center Freq 2.41200000 GHz

Start Freq 2.39950000 GHz

Stop Freq 2.42450000 GHz

CF Step 2.50000000 MHz Auto Man

Freq Offset 0.00000000 Hz

Signal Track On Off

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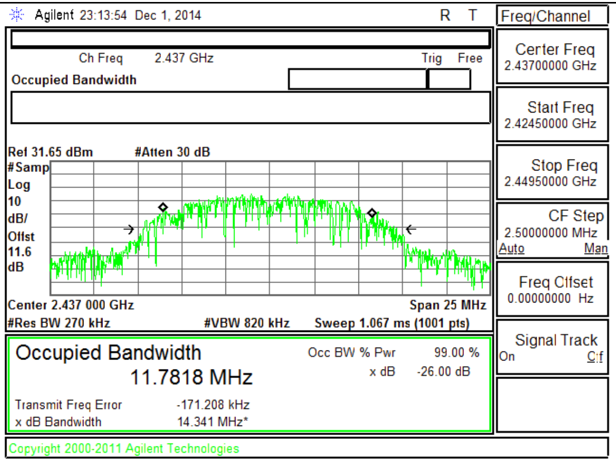
MID CHANNEL



Agilent 23:13:54 Dec 1, 2014 R T

Ch Freq 2.437 GHz Trig Free

Occupied Bandwidth

Ref 31.65 dBm #Atten 30 dB

#Samp Log 10 dB/ Offst 11.6 dB

Center 2.437 000 GHz Span 25 MHz

#Res BW 270 kHz #VBW 820 kHz Sweep 1.067 ms (1001 pts)

Occupied Bandwidth 11.7818 MHz

Occ BW % Pwr 99.00 %

x dB -26.00 dB

Transmit Freq Error -171.208 kHz

x dB Bandwidth 14.341 MHz*

Freq/Channel

Center Freq 2.43700000 GHz

Start Freq 2.42450000 GHz

Stop Freq 2.44950000 GHz

CF Step 2.50000000 MHz Auto Man

Freq Offset 0.00000000 Hz

Signal Track On Off

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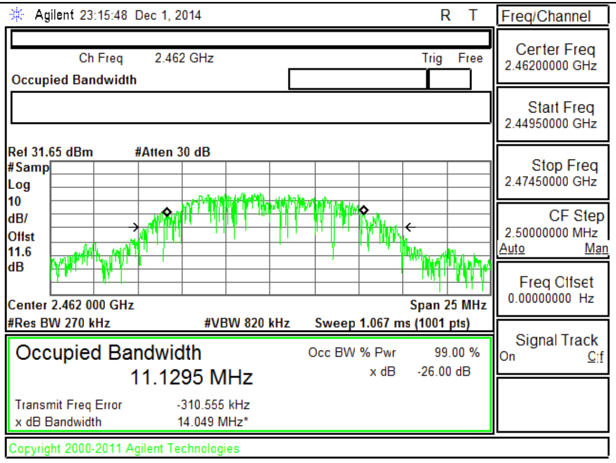
HIGH CHANNEL



Agilent 23:15:48 Dec 1, 2014 R T

Ch Freq 2.462 GHz Trig Free

Occupied Bandwidth

Ref 31.65 dBm #Atten 30 dB

#Samp Log 10 dB/ Offst 11.6 dB

Center 2.462 000 GHz Span 25 MHz

#Res BW 270 kHz #VBW 820 kHz Sweep 1.067 ms (1001 pts)

Occupied Bandwidth 11.1295 MHz

Occ BW % Pwr 99.00 %

x dB -26.00 dB

Transmit Freq Error -310.555 kHz

x dB Bandwidth 14.049 MHz*

Freq/Channel

Center Freq 2.46200000 GHz

Start Freq 2.44950000 GHz

Stop Freq 2.47450000 GHz

CF Step 2.50000000 MHz Auto Man

Freq Offset 0.00000000 Hz

Signal Track On Off

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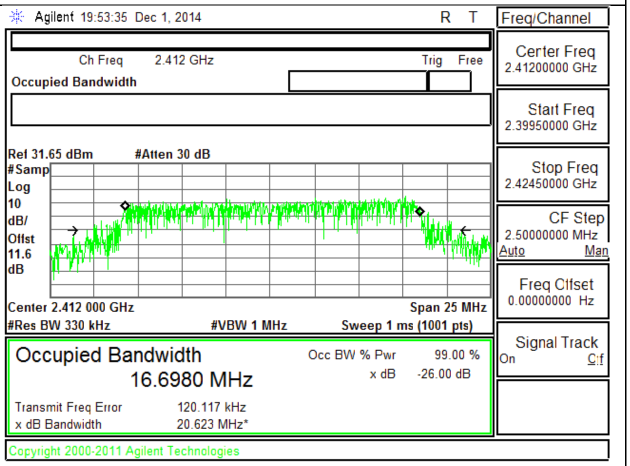
802.11g TEST RESULT TABLE (Chain 0)

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.70
Middle	2437	16.48
High	2462	16.57
Worst		16.70

LOW CHANNEL



Agilent 19:53:35 Dec 1, 2014

Ch Freq 2.412 GHz

Occupied Bandwidth

Ref 31.65 dBm #Atten 30 dB

#Samp Log 10 dB/ Offst 11.6 dB

Center 2.412 000 GHz Span 25 MHz

#Res BW 330 kHz #VBW 1 MHz Sweep 1 ms (1001 pts)

Occupied Bandwidth 16.6980 MHz

Occ BW % Pwr 99.00 %

x dB -26.00 dB

Transmit Freq Error 120.117 kHz

x dB Bandwidth 20.623 MHz*

Center Freq 2.41200000 GHz

Start Freq 2.39950000 GHz

Stop Freq 2.42450000 GHz

CF Step 2.50000000 MHz Auto

Freq Offset 0.00000000 Hz

Signal Track On

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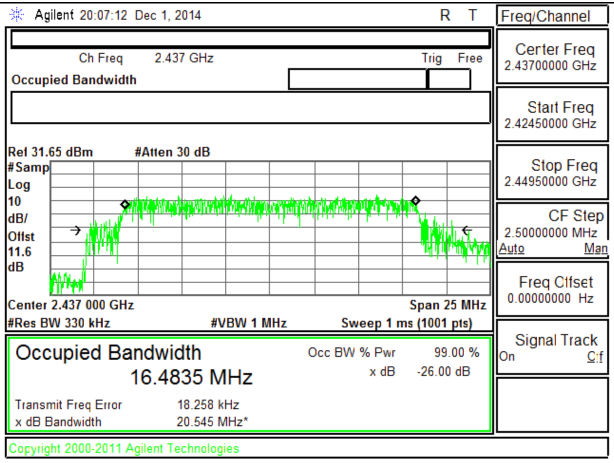
MID CHANNEL



Agilent 20:07:12 Dec 1, 2014

Ch Freq 2.437 GHz

Occupied Bandwidth

Ref 31.65 dBm #Atten 30 dB

#Samp Log 10 dB/ Offst 11.6 dB

Center 2.437 000 GHz Span 25 MHz

#Res BW 330 kHz #VBW 1 MHz Sweep 1 ms (1001 pts)

Occupied Bandwidth 16.4835 MHz

Occ BW % Pwr 99.00 %

x dB -26.00 dB

Transmit Freq Error 18.258 kHz

x dB Bandwidth 20.545 MHz*

Center Freq 2.43700000 GHz

Start Freq 2.42450000 GHz

Stop Freq 2.44950000 GHz

CF Step 2.50000000 MHz Auto

Freq Offset 0.00000000 Hz

Signal Track On

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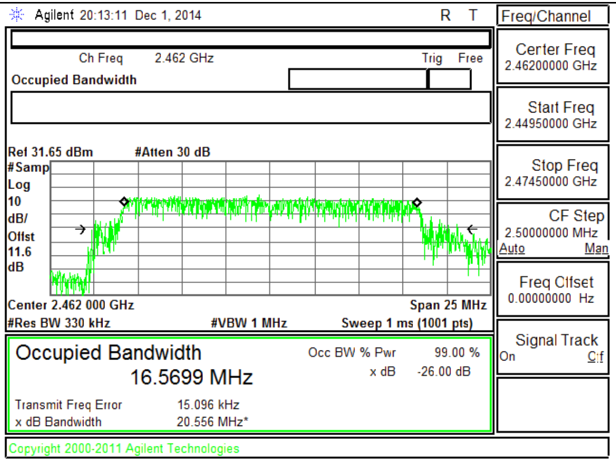
HIGH CHANNEL



Agilent 20:13:11 Dec 1, 2014

Ch Freq 2.462 GHz

Occupied Bandwidth

Ref 31.65 dBm #Atten 30 dB

#Samp Log 10 dB/ Offst 11.6 dB

Center 2.462 000 GHz Span 25 MHz

#Res BW 330 kHz #VBW 1 MHz Sweep 1 ms (1001 pts)

Occupied Bandwidth 16.5699 MHz

Occ BW % Pwr 99.00 %

x dB -26.00 dB

Transmit Freq Error 15.096 kHz

x dB Bandwidth 20.556 MHz*

Center Freq 2.46200000 GHz

Start Freq 2.44950000 GHz

Stop Freq 2.47450000 GHz

CF Step 2.50000000 MHz Auto

Freq Offset 0.00000000 Hz

Signal Track On

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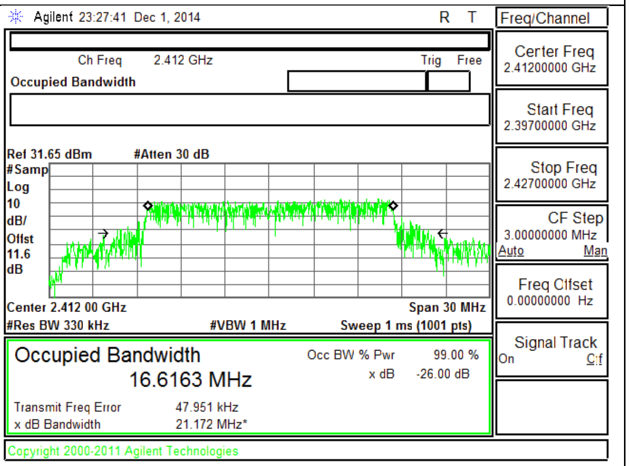
802.11g TEST RESULT TABLE (Chain 1)

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.62
Middle	2437	16.76
High	2462	16.61
Worst		16.76

LOW CHANNEL



Ch Freq 2.412 GHz Trig Free

Occupied Bandwidth

Center Freq 2.41200000 GHz

Start Freq 2.39700000 GHz

Stop Freq 2.42700000 GHz

CF Step 3.00000000 MHz

Freq Offset 0.00000000 Hz

Center 2.412 00 GHz Span 30 MHz

#Res BW 330 kHz #VBW 1 MHz Sweep 1 ms (1001 pts)

Occupied Bandwidth 16.6163 MHz

Occ BW % Pwr 99.00 %

x dB -26.00 dB

Transmit Freq Error 47.951 kHz

x dB Bandwidth 21.172 MHz*

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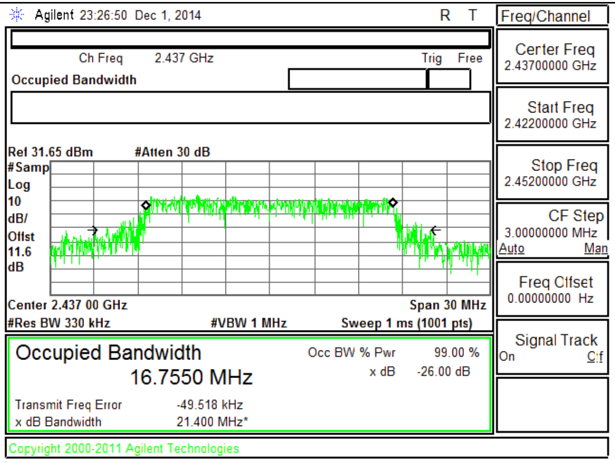
MID CHANNEL



Ch Freq 2.437 GHz Trig Free

Occupied Bandwidth

Center Freq 2.43700000 GHz

Start Freq 2.42200000 GHz

Stop Freq 2.45200000 GHz

CF Step 3.00000000 MHz

Freq Offset 0.00000000 Hz

Center 2.437 00 GHz Span 30 MHz

#Res BW 330 kHz #VBW 1 MHz Sweep 1 ms (1001 pts)

Occupied Bandwidth 16.7550 MHz

Occ BW % Pwr 99.00 %

x dB -26.00 dB

Transmit Freq Error -49.518 kHz

x dB Bandwidth 21.400 MHz*

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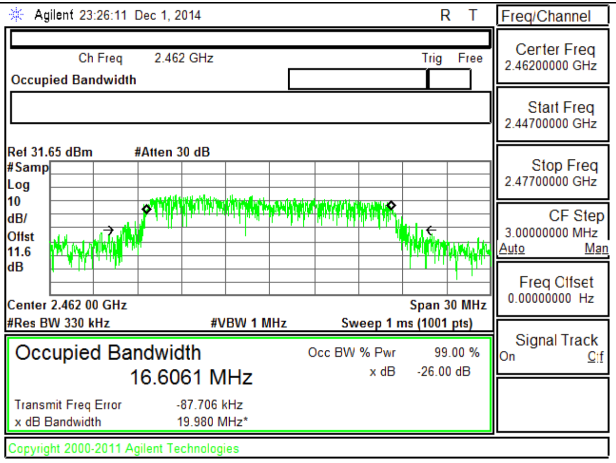
HIGH CHANNEL



Ch Freq 2.462 GHz Trig Free

Occupied Bandwidth

Center Freq 2.46200000 GHz

Start Freq 2.44700000 GHz

Stop Freq 2.47700000 GHz

CF Step 3.00000000 MHz

Freq Offset 0.00000000 Hz

Center 2.462 00 GHz Span 30 MHz

#Res BW 330 kHz #VBW 1 MHz Sweep 1 ms (1001 pts)

Occupied Bandwidth 16.6061 MHz

Occ BW % Pwr 99.00 %

x dB -26.00 dB

Transmit Freq Error -87.706 kHz

x dB Bandwidth 19.980 MHz*

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10.3. OUTPUT POWER

LIMITS

FCC §15.247

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

DIRECTIONAL ANTENNA GAIN

There is only one transmitter output therefore the directional gain is equal to the antenna gain.

RESULTS

10.3.1. 802.11b MODE IN THE 2.4 GHz BAND (Chain 0)

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	2412	3.36	30.00	30	36	30.00
Mid	2437	3.36	30.00	30	36	30.00
High	2462	3.36	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
1	2412	18.50	18.50	30.00	-11.50
6	2437	18.40	18.40	30.00	-11.60
10	2457	19.00	19.00	30.00	-11.00
11	2462	18.20	18.20	30.00	-11.80
Worst			19.00		

Note: the power readings above were measured with gated method, and the measurement was taken only during the ON time. No duty cycle correction was necessary.

10.3.2. 802.11b MODE IN THE 2.4 GHz BAND (Chain 1)

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	2412	0.85	30.00	30	36	30.00
Mid	2437	0.85	30.00	30	36	30.00
High	2462	0.85	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
1	2412	17.60	17.60	30.00	-12.40
6	2437	18.50	18.50	30.00	-11.50
10	2457	18.80	18.80	30.00	-11.20
11	2462	18.30	18.30	30.00	-11.70
Worst			18.80		

Note: the power readings above were measured with gated method, and the measurement was taken only during the ON time. No duty cycle correction was necessary.

10.3.3. 802.11g MODE IN THE 2.4 GHz BAND (Chain 0)

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	2412	3.36	30.00	30	36	30.00
Mid	2437	3.36	30.00	30	36	30.00
High	2462	3.36	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
1	2412	12.70	12.70	30.00	-17.30
2	2417	16.10	16.10	30.00	-13.90
3	2422	18.06	18.06	30.00	-11.94
4	2427	18.00	18.00	30.00	-12.00
6	2437	18.23	18.23	30.00	-11.77
8	2447	18.11	18.11	30.00	-11.89
9	2452	17.70	17.70	30.00	-12.30
10	2457	16.60	16.60	30.00	-13.40
11	2462	12.24	12.24	30.00	-17.76
Worst			18.23		

Note: the power readings above were measured with gated method, and the measurement was taken only during the ON time. No duty cycle correction was necessary.

10.3.4. 802.11g MODE IN THE 2.4 GHz BAND (Chain1)

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	2412	0.85	30.00	30	36	30.00
Mid	2437	0.85	30.00	30	36	30.00
High	2462	0.85	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
1	2412	12.60	12.60	30.00	-17.40
2	2417	16.20	16.20	30.00	-13.80
3	2422	18.30	18.30	30.00	-11.70
4	2427	17.90	17.90	30.00	-12.10
6	2437	18.20	18.20	30.00	-11.80
8	2447	18.20	18.20	30.00	-11.80
9	2452	18.10	18.10	30.00	-11.90
10	2457	17.04	17.04	30.00	-12.96
11	2462	12.58	12.58	30.00	-17.42
Worst			18.30		

Note: the power readings above were measured with gated method, and the measurement was taken only during the ON time. No duty cycle correction was necessary.

10.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

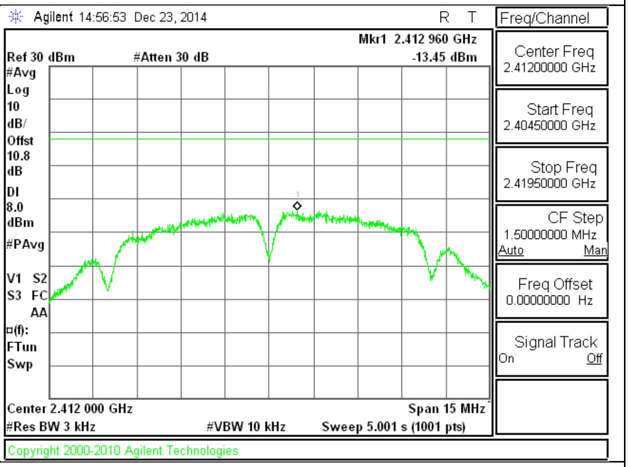
RESULTS

10.4.1. POWER SPECTRAL DENSITY PLOTS AND TABLE

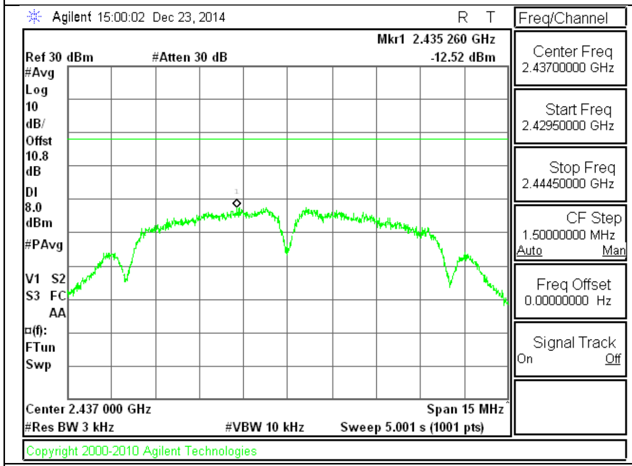
802.11b TEST RESULT TABLE (Chain 0)

Channel	Frequency (MHz)	Chain 0 (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-13.45	8	-21.45
Middle	2437	-12.52	8	-20.52
High	2462	-11.34	8	-19.34

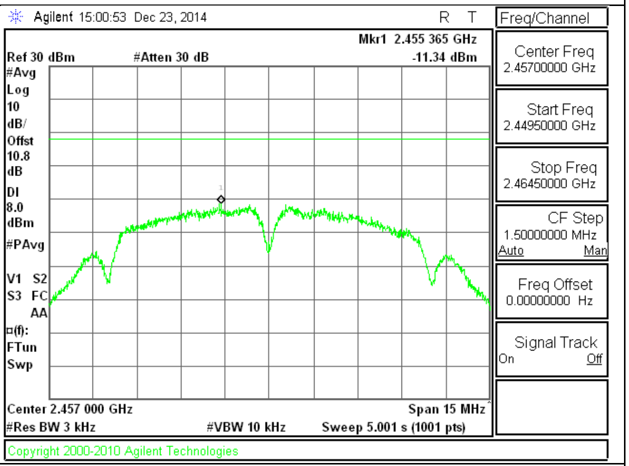
LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

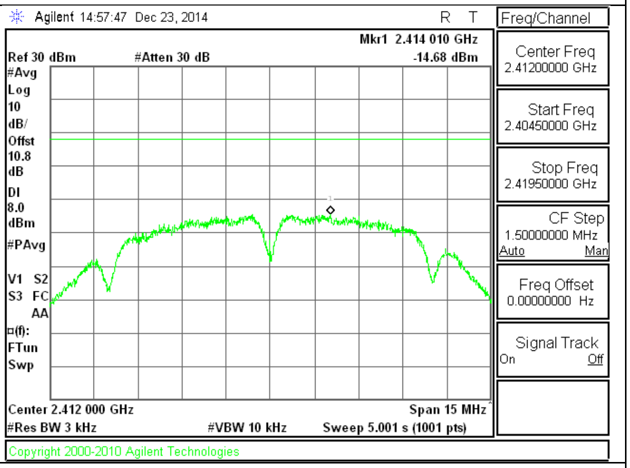


NOTE:

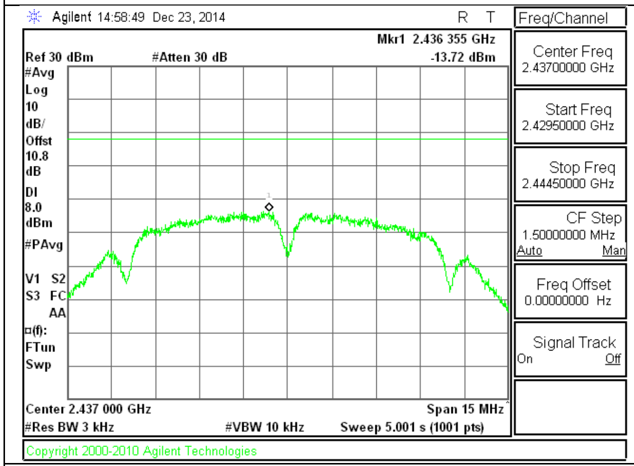
802.11b TEST RESULT TABLE (Chain 1)

Channel	Frequency (MHz)	Chain 1 (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-14.68	8	-22.68
Middle	2437	-13.72	8	-21.72
High	2462	-12.81	8	-20.81

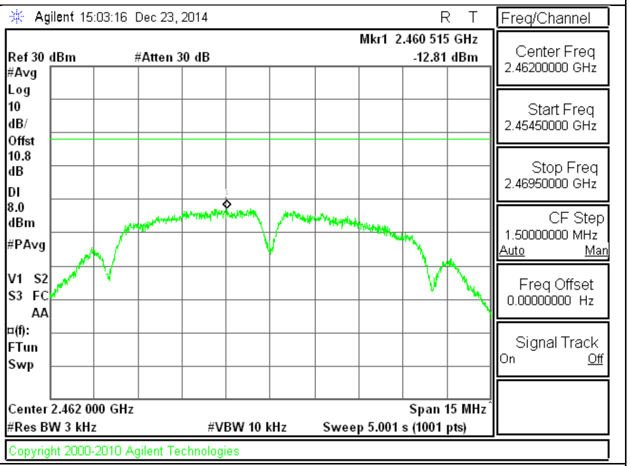
LOW CHANNEL


Agilent 14:57:47 Dec 23, 2014
Mkr1 2.414 010 GHz
Ref 30 dBm #Atten 30 dB -14.68 dBm
#Avg Log 10 dB/ Offst 10.8 dB DI 8.0 dBm #PAvg
Center 2.412 000 GHz Span 15 MHz
#Res BW 3 kHz #VBW 10 kHz Sweep 5.001 s (1001 pts)
Center Freq 2.41200000 GHz
Start Freq 2.40450000 GHz
Stop Freq 2.41950000 GHz
CF Step 1.50000000 MHz
Freq Offset 0.00000000 Hz

MID CHANNEL


Agilent 14:58:49 Dec 23, 2014
Mkr1 2.436 355 GHz
Ref 30 dBm #Atten 30 dB -13.72 dBm
#Avg Log 10 dB/ Offst 10.8 dB DI 8.0 dBm #PAvg
Center 2.437 000 GHz Span 15 MHz
#Res BW 3 kHz #VBW 10 kHz Sweep 5.001 s (1001 pts)
Center Freq 2.43700000 GHz
Start Freq 2.42950000 GHz
Stop Freq 2.44450000 GHz
CF Step 1.50000000 MHz
Freq Offset 0.00000000 Hz

HIGH CHANNEL

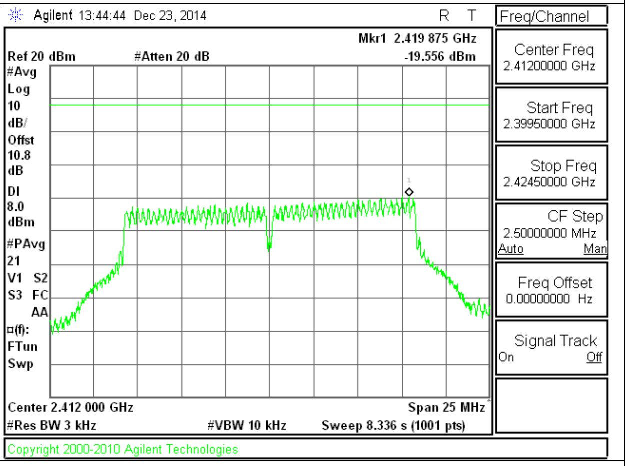

Agilent 15:03:16 Dec 23, 2014
Mkr1 2.460 515 GHz
Ref 30 dBm #Atten 30 dB -12.81 dBm
#Avg Log 10 dB/ Offst 10.8 dB DI 8.0 dBm #PAvg
Center 2.462 000 GHz Span 15 MHz
#Res BW 3 kHz #VBW 10 kHz Sweep 5.001 s (1001 pts)
Center Freq 2.46200000 GHz
Start Freq 2.45450000 GHz
Stop Freq 2.46950000 GHz
CF Step 1.50000000 MHz
Freq Offset 0.00000000 Hz

NOTE:

802.11g TEST RESULT TABLE (Chain 0)

Channel	Frequency (MHz)	Chain 0 (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-19.56	8	-27.56
Middle	2437	-15.24	8	-23.24
High	2462	-19.11	8	-27.11

LOW CHANNEL



Agilent 13:44:44 Dec 23, 2014
R T
Mkr1 2.419 875 GHz
Ref 20 dBm #Atten 20 dB -19.556 dBm
#Avg Log 10 dB/ Offst 10.8 dB
Dl 8.0 dBm
#PAvg 21
V1 S2 S3 FC AA
£(f): FTun Swp
Center 2.412 000 GHz Span 25 MHz
#Res BW 3 kHz #VBW 10 kHz Sweep 8.336 s (1001 pts)
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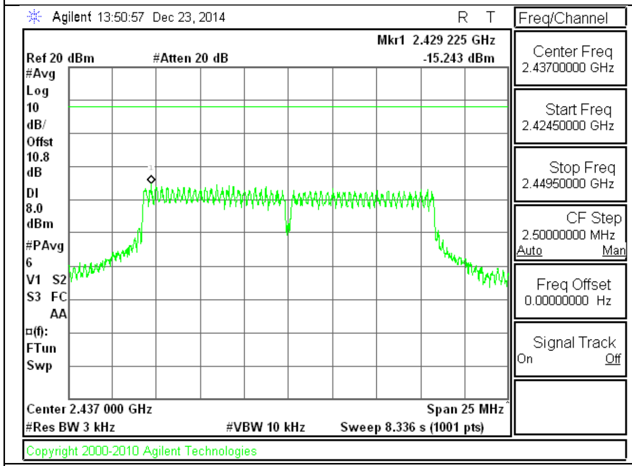
Freq/Channel
Center Freq 2.41200000 GHz
Start Freq 2.39950000 GHz
Stop Freq 2.42450000 GHz
CF Step 2.50000000 MHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off

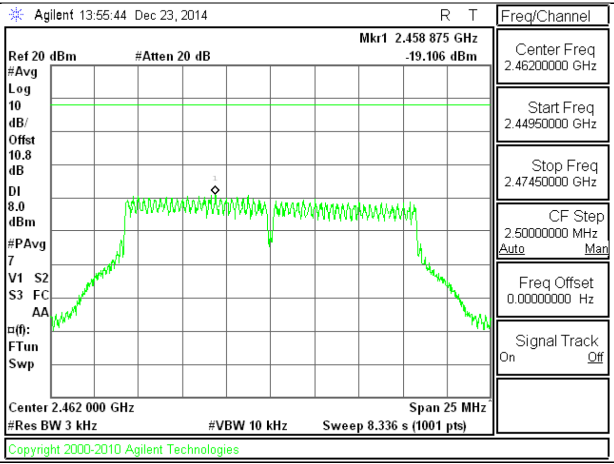
MID CHANNEL



Agilent 13:50:57 Dec 23, 2014
R T
Mkr1 2.429 225 GHz
Ref 20 dBm #Atten 20 dB -15.243 dBm
#Avg Log 10 dB/ Offst 10.8 dB
Dl 8.0 dBm
#PAvg 6
V1 S2 S3 FC AA
£(f): FTun Swp
Center 2.437 000 GHz Span 25 MHz
#Res BW 3 kHz #VBW 10 kHz Sweep 8.336 s (1001 pts)
Copyright 2000-2010 Agilent Technologies

Freq/Channel
Center Freq 2.43700000 GHz
Start Freq 2.42450000 GHz
Stop Freq 2.44950000 GHz
CF Step 2.50000000 MHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off

HIGH CHANNEL



Agilent 13:55:44 Dec 23, 2014
R T
Mkr1 2.458 875 GHz
Ref 20 dBm #Atten 20 dB -19.106 dBm
#Avg Log 10 dB/ Offst 10.8 dB
Dl 8.0 dBm
#PAvg 7
V1 S2 S3 FC AA
£(f): FTun Swp
Center 2.462 000 GHz Span 25 MHz
#Res BW 3 kHz #VBW 10 kHz Sweep 8.336 s (1001 pts)
Copyright 2000-2010 Agilent Technologies

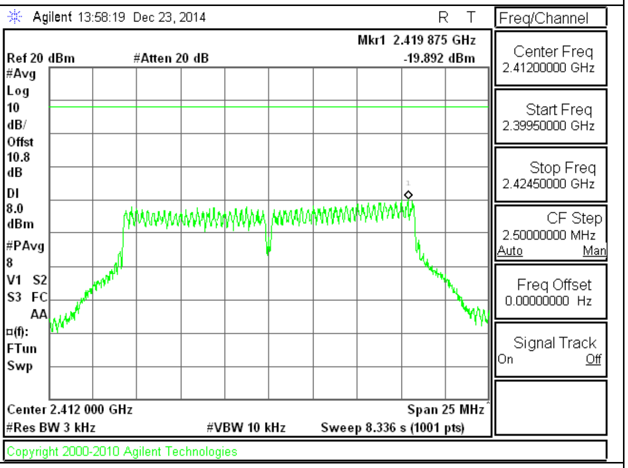
Freq/Channel
Center Freq 2.46200000 GHz
Start Freq 2.44950000 GHz
Stop Freq 2.47450000 GHz
CF Step 2.50000000 MHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off

NOTE:

802.11g TEST RESULT TABLE (Chain 1)

Channel	Frequency (MHz)	Chain 1 (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-19.89	8	-27.89
Middle	2437	-15.03	8	-23.03
High	2462	-18.21	8	-26.21

LOW CHANNEL



Agilent 13:58:19 Dec 23, 2014 R T

Mkr1 2.419 875 GHz
Ref 20 dBm #Atten 20 dB -19.892 dBm
#Avg Log 10 dB/ Offst 10.8 dB
Dl 8.0 dBm
#PAvg 8
V1 S2 S3 FC AA
¤(f): FTun Swp
Center 2.412 000 GHz Span 25 MHz
#Res BW 3 kHz #VBW 10 kHz Sweep 8.336 s (1001 pts)

Freq/Channel
Center Freq 2.41200000 GHz
Start Freq 2.39950000 GHz
Stop Freq 2.42450000 GHz
CF Step 2.50000000 MHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off

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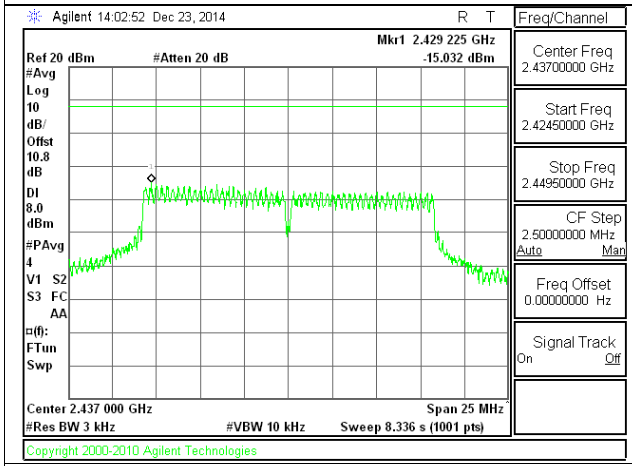
MID CHANNEL



Agilent 14:02:52 Dec 23, 2014 R T

Mkr1 2.429 225 GHz
Ref 20 dBm #Atten 20 dB -15.032 dBm
#Avg Log 10 dB/ Offst 10.8 dB
Dl 8.0 dBm
#PAvg 4
V1 S2 S3 FC AA
¤(f): FTun Swp
Center 2.437 000 GHz Span 25 MHz
#Res BW 3 kHz #VBW 10 kHz Sweep 8.336 s (1001 pts)

Freq/Channel
Center Freq 2.43700000 GHz
Start Freq 2.42450000 GHz
Stop Freq 2.44950000 GHz
CF Step 2.50000000 MHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off

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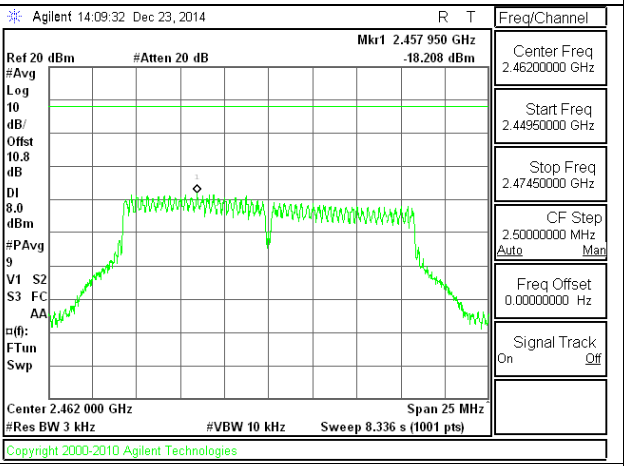
HIGH CHANNEL



Agilent 14:09:32 Dec 23, 2014 R T

Mkr1 2.457 950 GHz
Ref 20 dBm #Atten 20 dB -18.208 dBm
#Avg Log 10 dB/ Offst 10.8 dB
Dl 8.0 dBm
#PAvg 9
V1 S2 S3 FC AA
¤(f): FTun Swp
Center 2.462 000 GHz Span 25 MHz
#Res BW 3 kHz #VBW 10 kHz Sweep 8.336 s (1001 pts)

Freq/Channel
Center Freq 2.46200000 GHz
Start Freq 2.44950000 GHz
Stop Freq 2.47450000 GHz
CF Step 2.50000000 MHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off

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NOTE:

10.5. CONDUCTED SPURIOUS AND OUT-OF-BAND EMISSIONS

LIMITS

FCC §15.247 (d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

TEST PROCEDURE

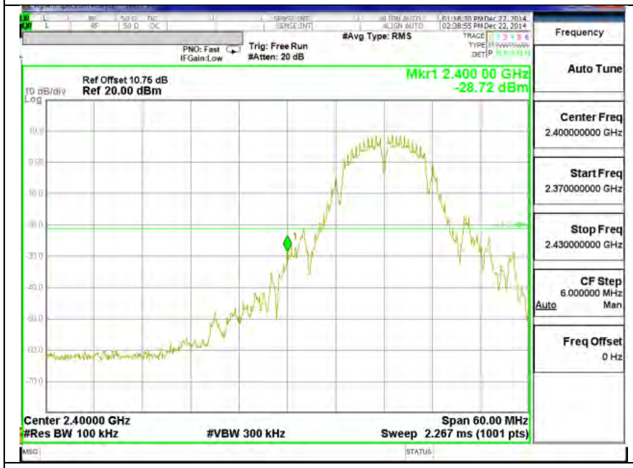
The transmitter output is connected to a spectrum analyzer with RBW = 100 kHz, VBW = 300 kHz, peak detector, and max hold. Measurements utilizing these settings are made of the in-band reference level, bandedge (where measurements to the general radiated limits will not be made) and out-of-band emissions.

RESULTS

10.5.1. BANDEDGE AND SPURIOUS EMISSIONS PLOTS

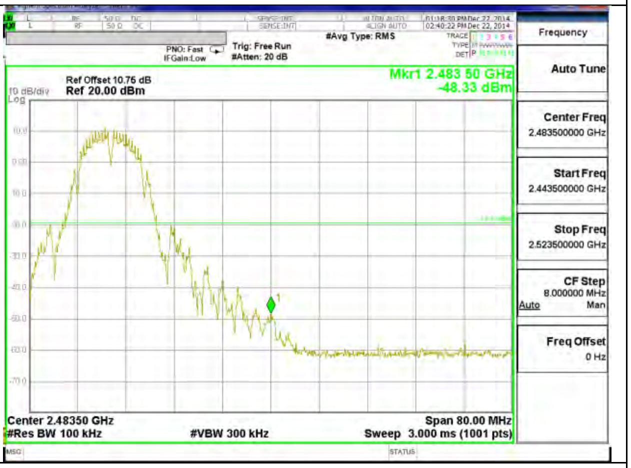
802.11b Mode – Chain 0

LOW CHANNEL BANDEDGE



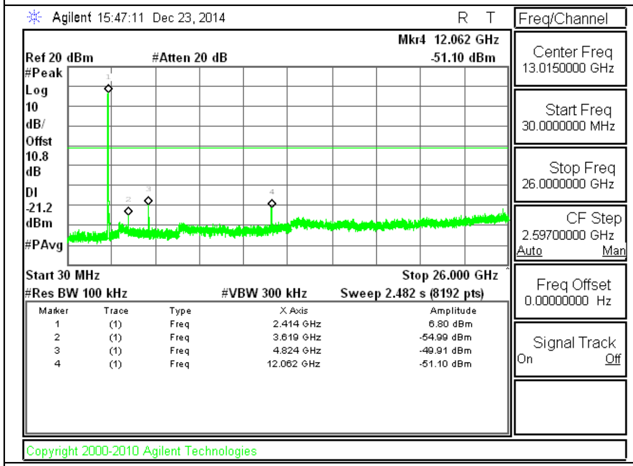
#Avg Type: RMS
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
Ref Offset 10.76 dB
10 dB/div Ref 20.00 dBm
Mkr1 2.400 00 GHz
-28.72 dBm
Center 2.40000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 60.00 MHz
Sweep 2.267 ms (1001 pts)
Center Freq 2.400000000 GHz
Start Freq 2.370000000 GHz
Stop Freq 2.430000000 GHz
CF Step 6.000000 MHz Auto Man
Freq Offset 0 Hz

HIGH CHANNEL BANDEDGE



#Avg Type: RMS
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
Ref Offset 10.76 dB
10 dB/div Ref 20.00 dBm
Mkr1 2.483 50 GHz
-48.33 dBm
Center 2.48350 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 80.00 MHz
Sweep 3.000 ms (1001 pts)
Center Freq 2.483500000 GHz
Start Freq 2.443500000 GHz
Stop Freq 2.523500000 GHz
CF Step 8.000000 MHz Auto Man
Freq Offset 0 Hz

LOW CHANNEL SPURIOUS



Agilent 15:47:11 Dec 23, 2014
Mkr4 12.062 GHz
Ref 20 dBm #Atten 20 dB -51.10 dBm
#Peak
Log
10
dB/
Offst
10.8
dB
Dl
-21.2
dBm
#PAvg
Start 30 MHz Stop 26.000 GHz
#Res BW 100 kHz #VBW 300 kHz Sweep 2.482 s (8192 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.414 GHz	6.80 dBm
2	(1)	Freq	3.619 GHz	-54.99 dBm
3	(1)	Freq	4.824 GHz	-49.91 dBm
4	(1)	Freq	12.062 GHz	-51.10 dBm

Center Freq 13.0150000 GHz
Start Freq 30.0000000 MHz
Stop Freq 26.0000000 GHz
CF Step 2.59700000 GHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off

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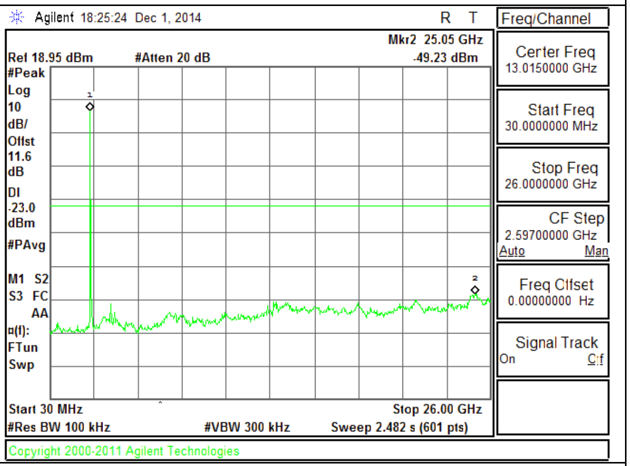
MID CHANNEL SPURIOUS



Agilent 18:25:24 Dec 1, 2014
Mkr2 25.05 GHz
Ref 18.95 dBm #Atten 20 dB -49.23 dBm
#Peak
Log
10
dB/
Offst
11.6
dB
Dl
-23.0
dBm
#PAvg
M1 S2
S3 FC
AA
Start 30 MHz Stop 26.00 GHz
#Res BW 100 kHz #VBW 300 kHz Sweep 2.482 s (601 pts)
Center Freq 13.0150000 GHz
Start Freq 30.0000000 MHz
Stop Freq 26.0000000 GHz
CF Step 2.59700000 GHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off

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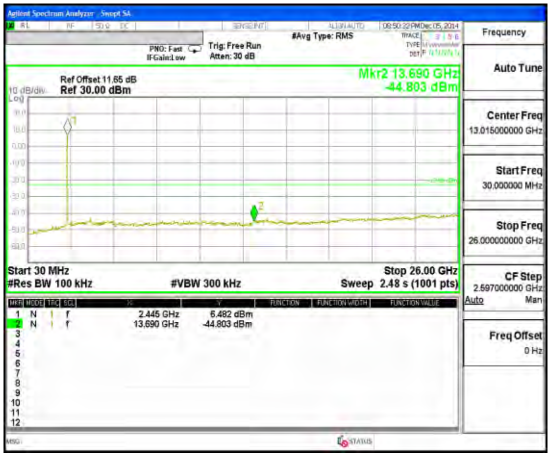
HIGH CHANNEL SPURIOUS



Agilent Spectrum Analyzer - Swept SA
#Avg Type: RMS
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Ref Offset 11.65 dB
10 dB/div Ref 30.00 dBm
Mkr2 13.690 GHz
-44.803 dBm
Start 30 MHz Stop 26.00 GHz
#Res BW 100 kHz #VBW 300 kHz Sweep 2.48 s (1001 pts)

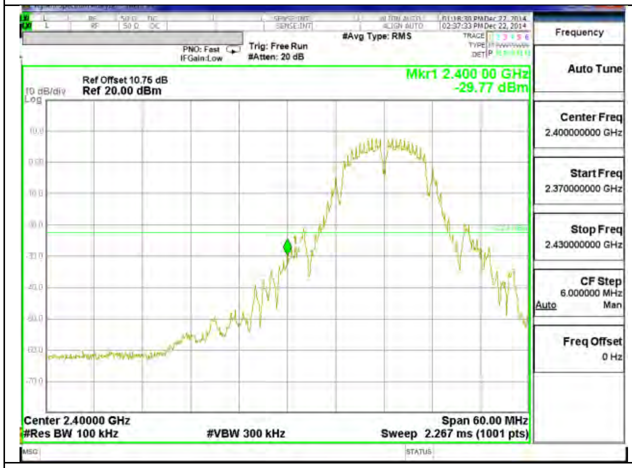
MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.445 GHz	6.482 dBm			
2	N	1	f	13.690 GHz	-44.803 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

Center Freq 13.015000000 GHz
Start Freq 30.000000 MHz
Stop Freq 26.000000000 GHz
CF Step 2.597000000 GHz Auto Man
Freq Offset 0 Hz

NOTE:

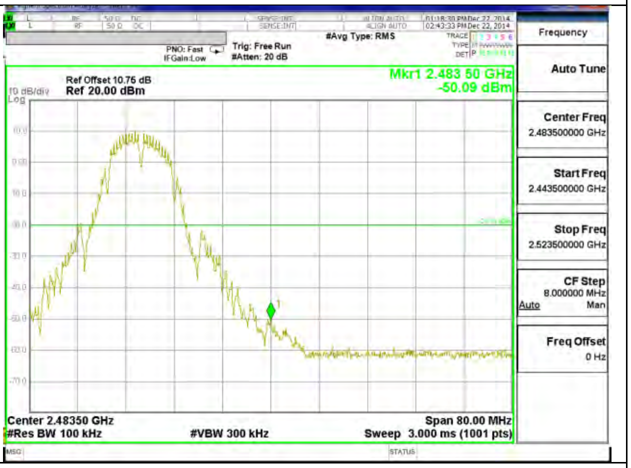
802.11b Mode – Chain 1

LOW CHANNEL BANDEDGE



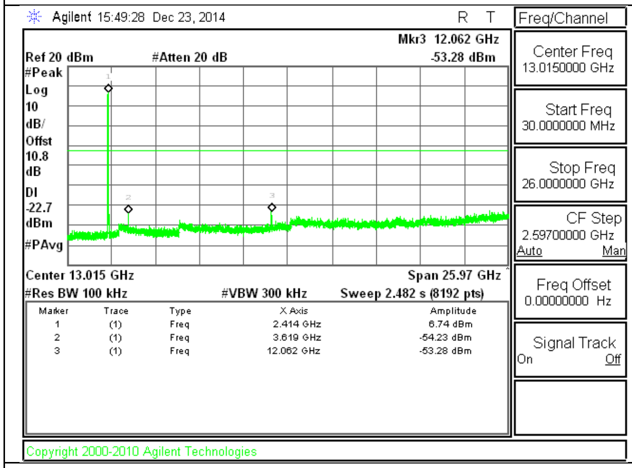
02:37:33 PM Dec 22, 2014
#Avg Type: RMS
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
Ref Offset 10.76 dB
10 dB/div Log
Ref 20.00 dBm
Mkr1 2.400 00 GHz
-29.77 dBm
Center 2.40000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 60.00 MHz
Sweep 2.267 ms (1001 pts)
Center Freq 2.400000000 GHz
Start Freq 2.370000000 GHz
Stop Freq 2.430000000 GHz
CF Step 6.000000 MHz Auto Man
Freq Offset 0 Hz

HIGH CHANNEL BANDEDGE



02:43:33 PM Dec 22, 2014
#Avg Type: RMS
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
Ref Offset 10.76 dB
10 dB/div Log
Ref 20.00 dBm
Mkr1 2.483 50 GHz
-50.09 dBm
Center 2.48350 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 80.00 MHz
Sweep 3.000 ms (1001 pts)
Center Freq 2.483500000 GHz
Start Freq 2.443500000 GHz
Stop Freq 2.523500000 GHz
CF Step 8.000000 MHz Auto Man
Freq Offset 0 Hz

LOW CHANNEL SPURIOUS



Agilent 15:49:28 Dec 23, 2014 R T
Mkr3 12.062 GHz
Ref 20 dBm #Atten 20 dB -53.28 dBm
#Peak
Log
10
dB/
Offst
10.8
dB
Dl
-22.7
dBm
#PAvg
Center 13.015 GHz Span 25.97 GHz
#Res BW 100 kHz #VBW 300 kHz Sweep 2.482 s (8192 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.414 GHz	6.74 dBm
2	(1)	Freq	3.619 GHz	-54.23 dBm
3	(1)	Freq	12.062 GHz	-53.28 dBm

Center Freq 13.0150000 GHz
Start Freq 30.0000000 MHz
Stop Freq 26.0000000 GHz
CF Step 2.59700000 GHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off

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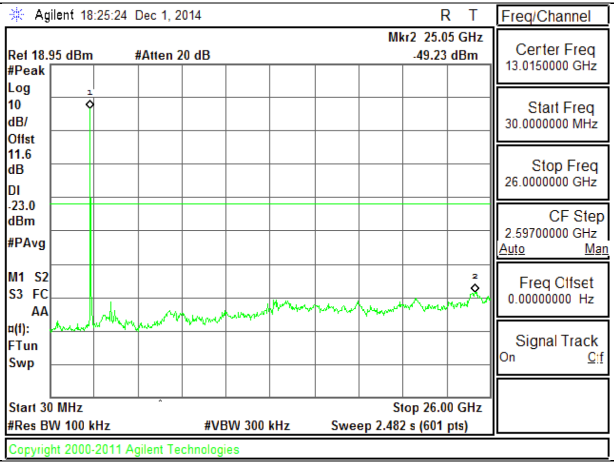
MID CHANNEL SPURIOUS



Agilent 18:25:24 Dec 1, 2014 R T
Mkr2 25.05 GHz
Ref 18.95 dBm #Atten 20 dB -49.23 dBm
#Peak
Log
10
dB/
Offst
11.6
dB
Dl
-23.0
dBm
#PAvg
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Start 30 MHz Stop 26.00 GHz
#Res BW 100 kHz #VBW 300 kHz Sweep 2.482 s (601 pts)
Center Freq 13.0150000 GHz
Start Freq 30.0000000 MHz
Stop Freq 26.0000000 GHz
CF Step 2.59700000 GHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off

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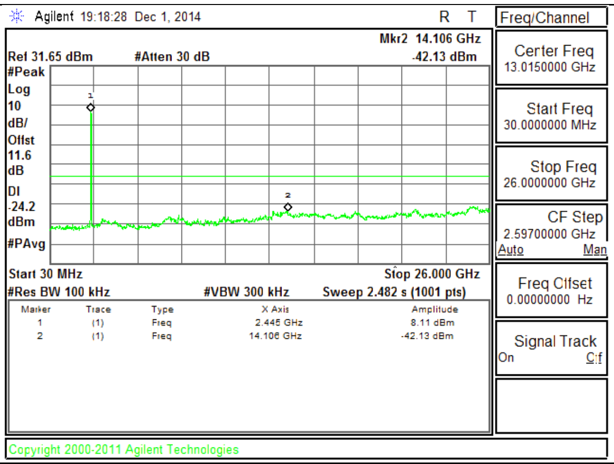
HIGH CHANNEL SPURIOUS



Agilent 19:18:28 Dec 1, 2014 R T
Mkr2 14.106 GHz
Ref 31.65 dBm #Atten 30 dB -42.13 dBm
#Peak
Log
10
dB/
Offst
11.6
dB
Dl
-24.2
dBm
#PAvg
Start 30 MHz Stop 26.000 GHz
#Res BW 100 kHz #VBW 300 kHz Sweep 2.482 s (1001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.445 GHz	8.11 dBm
2	(1)	Freq	14.106 GHz	-42.13 dBm

Center Freq 13.0150000 GHz
Start Freq 30.0000000 MHz
Stop Freq 26.0000000 GHz
CF Step 2.59700000 GHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off

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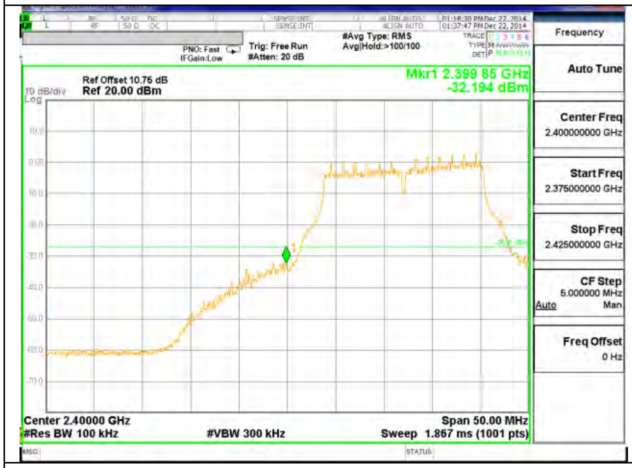
NOTE:

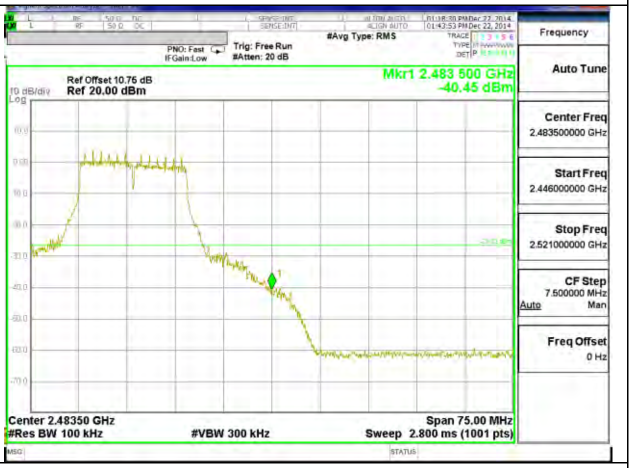
802.11g Mode – Chain 0

LOW CHANNEL BANDEDGE



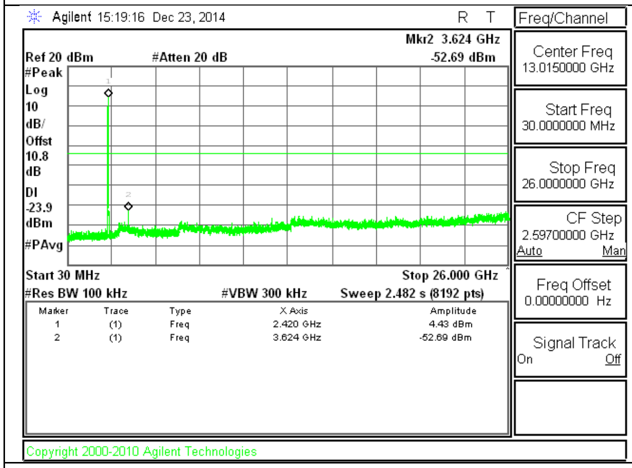
01:37:47 PM Dec 22, 2014
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
#Avg Type: RMS
Avg|Hold:>100/100
Ref Offset 10.76 dB
10 dB/div Ref 20.00 dBm
Mkr1 2.399 85 GHz -32.194 dBm
Center Freq 2.400000000 GHz
Start Freq 2.375000000 GHz
Stop Freq 2.425000000 GHz
CF Step 5.000000 MHz Auto Man
Freq Offset 0 Hz
Center 2.40000 GHz Span 50.00 MHz
#Res BW 100 kHz #VBW 300 kHz Sweep 1.867 ms (1001 pts)

HIGH CHANNEL BANDEDGE



01:43:53 PM Dec 22, 2014
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
#Avg Type: RMS
Ref Offset 10.76 dB
10 dB/div Ref 20.00 dBm
Mkr1 2.483 500 GHz -40.45 dBm
Center Freq 2.483500000 GHz
Start Freq 2.446000000 GHz
Stop Freq 2.521000000 GHz
CF Step 7.500000 MHz Auto Man
Freq Offset 0 Hz
Center 2.48350 GHz Span 75.00 MHz
#Res BW 100 kHz #VBW 300 kHz Sweep 2.800 ms (1001 pts)

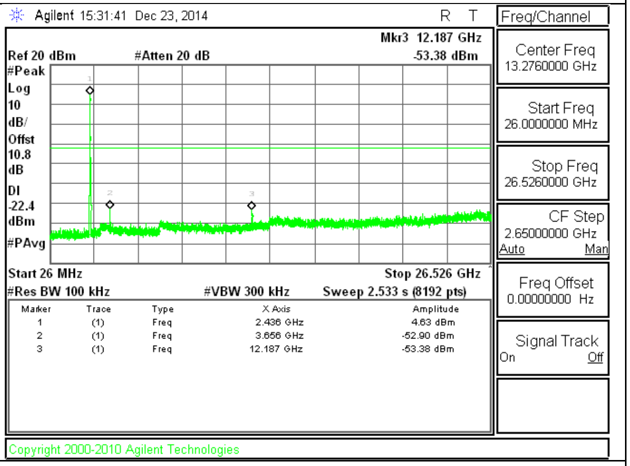
LOW CHANNEL SPURIOUS



Agilent 15:19:16 Dec 23, 2014
Ref 20 dBm #Atten 20 dB
Mkr2 3.624 GHz -52.69 dBm
#Peak
Log 10 dB/
Offst 10.8 dB
Dl -23.9 dBm
#PAvg
Start 30 MHz Stop 26.000 GHz
#Res BW 100 kHz #VBW 300 kHz Sweep 2.482 s (8192 pts)
Center Freq 13.0150000 GHz
Start Freq 30.0000000 MHz
Stop Freq 26.0000000 GHz
CF Step 2.59700000 GHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.420 GHz	4.43 dBm
2	(1)	Freq	3.624 GHz	-52.69 dBm

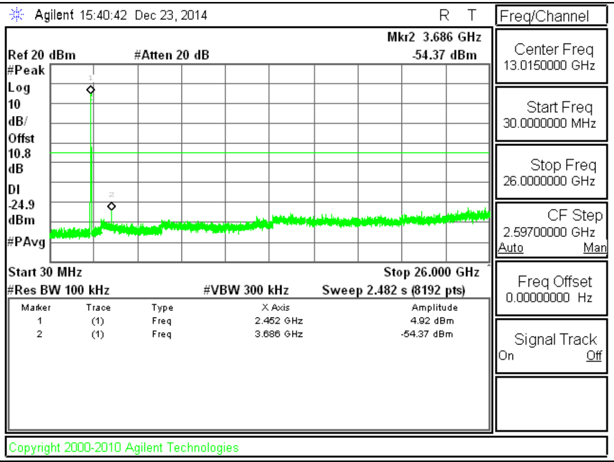
MID CHANNEL SPURIOUS



Agilent 15:31:41 Dec 23, 2014
Ref 20 dBm #Atten 20 dB
Mkr3 12.187 GHz -53.38 dBm
#Peak
Log 10 dB/
Offst 10.8 dB
Dl -22.4 dBm
#PAvg
Start 26 MHz Stop 26.526 GHz
#Res BW 100 kHz #VBW 300 kHz Sweep 2.533 s (8192 pts)
Center Freq 13.2760000 GHz
Start Freq 26.0000000 MHz
Stop Freq 26.5260000 GHz
CF Step 2.65000000 GHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.436 GHz	4.63 dBm
2	(1)	Freq	3.656 GHz	-52.90 dBm
3	(1)	Freq	12.187 GHz	-53.38 dBm

HIGH CHANNEL SPURIOUS



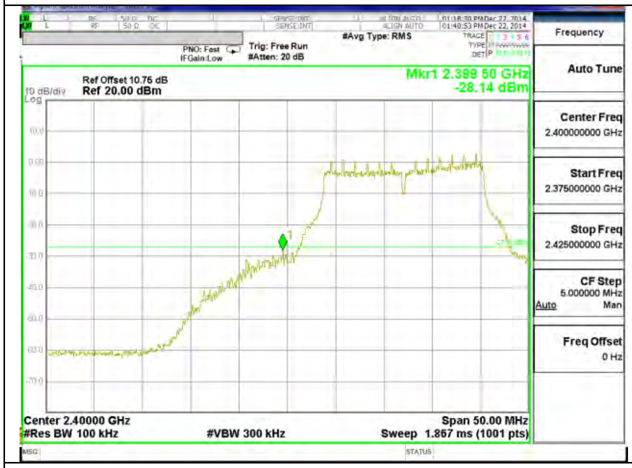
Agilent 15:40:42 Dec 23, 2014
Ref 20 dBm #Atten 20 dB
Mkr2 3.686 GHz -54.37 dBm
#Peak
Log 10 dB/
Offst 10.8 dB
Dl -24.9 dBm
#PAvg
Start 30 MHz Stop 26.000 GHz
#Res BW 100 kHz #VBW 300 kHz Sweep 2.482 s (8192 pts)
Center Freq 13.0150000 GHz
Start Freq 30.0000000 MHz
Stop Freq 26.0000000 GHz
CF Step 2.59700000 GHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.452 GHz	4.92 dBm
2	(1)	Freq	3.686 GHz	-54.37 dBm

NOTE:

802.11g Mode – Chain 1

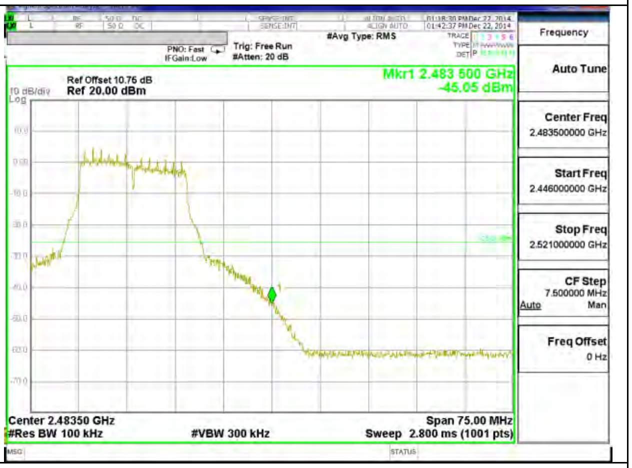
LOW CHANNEL BANDEDGE



01:40:53 PM Dec 22, 2014
PNO: Fast IFGain:Low
Trig: Free Run
#Atten: 20 dB
#Avg Type: RMS
Ref Offset 10.76 dB
10 dB/div Ref 20.00 dBm
Log
Mkr1 2.399 50 GHz
-28.14 dBm
Center 2.40000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 50.00 MHz
Sweep 1.867 ms (1001 pts)

Frequency
Auto Tune
Center Freq 2.400000000 GHz
Start Freq 2.375000000 GHz
Stop Freq 2.425000000 GHz
CF Step 5.000000 MHz Auto Man
Freq Offset 0 Hz

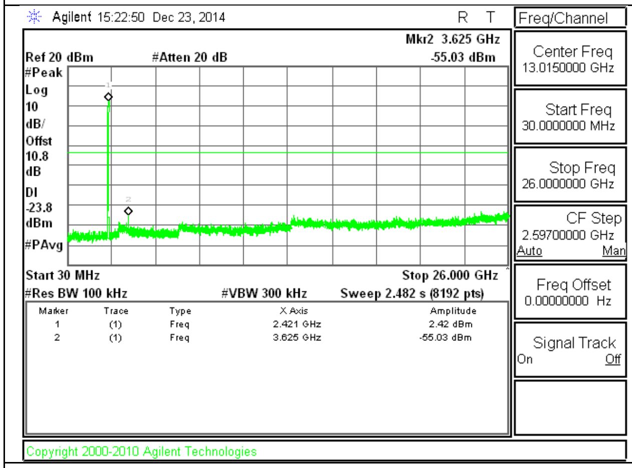
HIGH CHANNEL BANDEDGE



01:42:37 PM Dec 22, 2014
PNO: Fast IFGain:Low
Trig: Free Run
#Atten: 20 dB
#Avg Type: RMS
Ref Offset 10.76 dB
10 dB/div Ref 20.00 dBm
Log
Mkr1 2.483 500 GHz
-45.05 dBm
Center 2.48350 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 75.00 MHz
Sweep 2.800 ms (1001 pts)

Frequency
Auto Tune
Center Freq 2.483500000 GHz
Start Freq 2.446000000 GHz
Stop Freq 2.521000000 GHz
CF Step 7.500000 MHz Auto Man
Freq Offset 0 Hz

LOW CHANNEL SPURIOUS



Agilent 15:22:50 Dec 23, 2014
R T
Mkr2 3.625 GHz
Ref 20 dBm #Atten 20 dB -55.03 dBm
#Peak
Log
10
dB/
Offst
10.8
dB
Dl
-23.8
dBm
#PAvg
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 26.000 GHz
Sweep 2.482 s (8192 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.421 GHz	2.42 dBm
2	(1)	Freq	3.625 GHz	-55.03 dBm

Freq/Channel
Center Freq 13.0150000 GHz
Start Freq 30.0000000 MHz
Stop Freq 26.0000000 GHz
CF Step 2.59700000 GHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off

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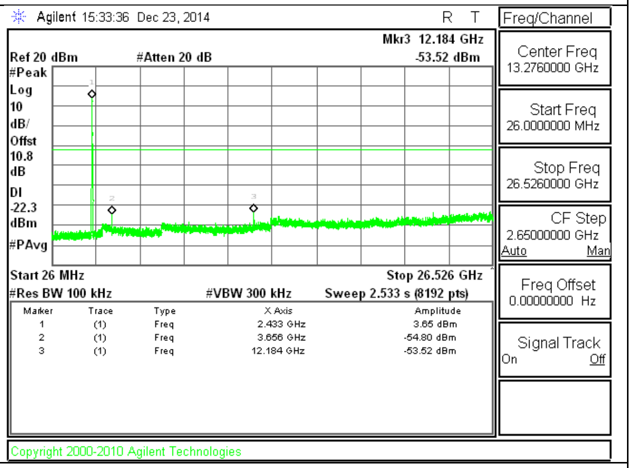
MID CHANNEL SPURIOUS



Agilent 15:33:36 Dec 23, 2014
R T
Mkr3 12.184 GHz
Ref 20 dBm #Atten 20 dB -53.52 dBm
#Peak
Log
10
dB/
Offst
10.8
dB
Dl
-22.3
dBm
#PAvg
Start 26 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 26.526 GHz
Sweep 2.533 s (8192 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.433 GHz	3.65 dBm
2	(1)	Freq	3.656 GHz	-54.80 dBm
3	(1)	Freq	12.184 GHz	-53.52 dBm

Freq/Channel
Center Freq 13.2760000 GHz
Start Freq 26.0000000 MHz
Stop Freq 26.5260000 GHz
CF Step 2.65000000 GHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off

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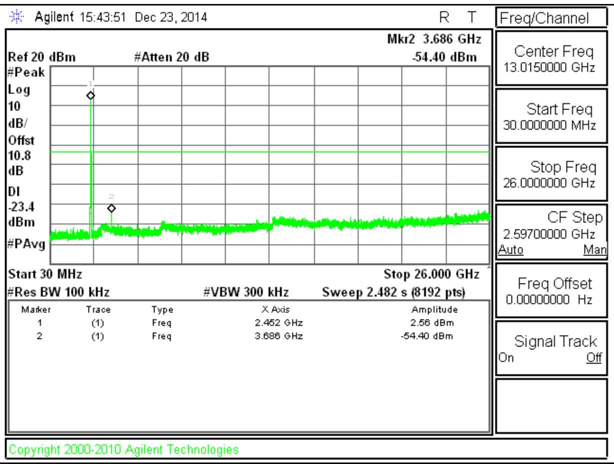
HIGH CHANNEL SPURIOUS



Agilent 15:43:51 Dec 23, 2014
R T
Mkr2 3.686 GHz
Ref 20 dBm #Atten 20 dB -54.40 dBm
#Peak
Log
10
dB/
Offst
10.8
dB
Dl
-23.4
dBm
#PAvg
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 26.000 GHz
Sweep 2.482 s (8192 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.452 GHz	2.56 dBm
2	(1)	Freq	3.686 GHz	-54.40 dBm

Freq/Channel
Center Freq 13.0150000 GHz
Start Freq 30.0000000 MHz
Stop Freq 26.0000000 GHz
CF Step 2.59700000 GHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off

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NOTE:

11. ANTENNA PORT TEST RESULTS MIMO 802.11n Mode

11.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

The minimum 6 dB bandwidth shall be at least 500 kHz.

TEST PROCEDURE

Reference to KDB 558074 D01 DTS Meas Guidance v03r05: The transmitter output is connected to a spectrum analyzer with the RBW set to100KHz, the VBW >= 3 x RBW, peak detector and max hold.

KDB Reference
662911 D01 Multiple Transmitter Output v02r01

RESULTS

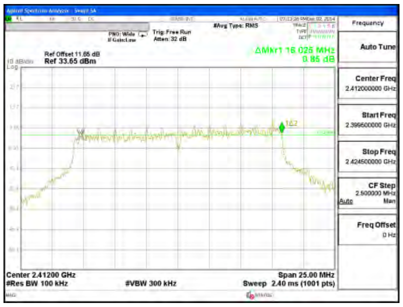
11.1.1. 6 dB BANDWIDTH PLOTS AND TABLE

802.11n HT20 TEST RESULT TABLE

Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	Minimum Limit (MHz)
2412	16.03	16.08	0.5
2437	16.46	16.50	0.5
2462	16.45	16.50	0.5
Worst	16.03		

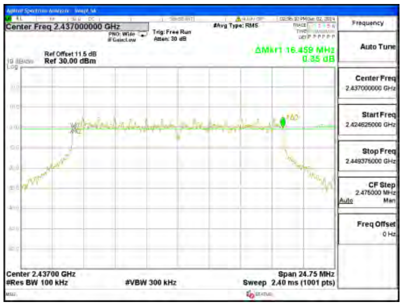
CHAIN 0

LOW CHANNEL



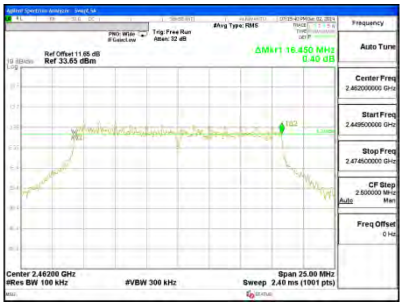
PNO: Wide IFGain:Low
Trig: Free Run
Atten: 32 dB
#Avg Type: RMS
Ref Offset 11.65 dB
Ref 33.65 dBm
10 dB/div Log
ΔMkr1 16.025 MHz
0.85 dB
Center Freq 2.412000000 GHz
Start Freq 2.399500000 GHz
Stop Freq 2.424500000 GHz
CF Step 2.500000 MHz Auto Man
Freq Offset 0 Hz
Center 2.41200 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 25.00 MHz
Sweep 2.40 ms (1001 pts)

MID CHANNEL



Center Freq 2.437000000 GHz
PNO: Wide IFGain:Low
Trig: Free Run
Atten: 30 dB
#Avg Type: RMS
Ref Offset 11.5 dB
Ref 30.00 dBm
10 dB/div Log
ΔMkr1 16.459 MHz
0.35 dB
Center Freq 2.437000000 GHz
Start Freq 2.424625000 GHz
Stop Freq 2.449375000 GHz
CF Step 2.475000 MHz Auto Man
Freq Offset 0 Hz
Center 2.43700 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 24.75 MHz
Sweep 2.40 ms (1001 pts)

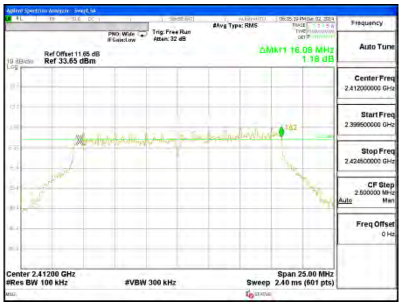
HIGH CHANNEL



PNO: Wide IFGain:Low
Trig: Free Run
Atten: 32 dB
#Avg Type: RMS
Ref Offset 11.65 dB
Ref 33.65 dBm
10 dB/div Log
ΔMkr1 16.450 MHz
0.40 dB
Center Freq 2.462000000 GHz
Start Freq 2.449500000 GHz
Stop Freq 2.474500000 GHz
CF Step 2.500000 MHz Auto Man
Freq Offset 0 Hz
Center 2.46200 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 25.00 MHz
Sweep 2.40 ms (1001 pts)

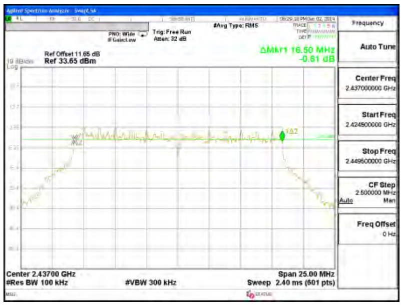
CHAIN 1

LOW CHANNEL



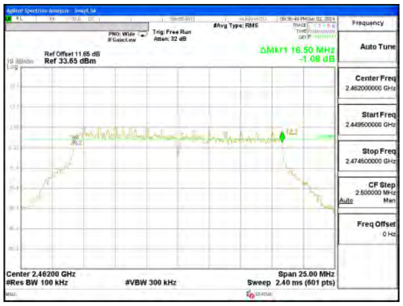
PNO: Wide IFGain:Low
Trig: Free Run
Atten: 32 dB
#Avg Type: RMS
Ref Offset 11.65 dB
Ref 33.65 dBm
10 dB/div Log
ΔMkr1 16.08 MHz
1.18 dB
Center Freq 2.412000000 GHz
Start Freq 2.399500000 GHz
Stop Freq 2.424500000 GHz
CF Step 2.500000 MHz Auto Man
Freq Offset 0 Hz
Center 2.41200 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 25.00 MHz
Sweep 2.40 ms (601 pts)

MID CHANNEL



PNO: Wide IFGain:Low
Trig: Free Run
Atten: 32 dB
#Avg Type: RMS
Ref Offset 11.65 dB
Ref 33.65 dBm
10 dB/div Log
ΔMkr1 16.50 MHz
-0.81 dB
Center Freq 2.437000000 GHz
Start Freq 2.424500000 GHz
Stop Freq 2.449500000 GHz
CF Step 2.500000 MHz Auto Man
Freq Offset 0 Hz
Center 2.43700 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 25.00 MHz
Sweep 2.40 ms (601 pts)

HIGH CHANNEL



PNO: Wide IFGain:Low
Trig: Free Run
Atten: 32 dB
#Avg Type: RMS
Ref Offset 11.65 dB
Ref 33.65 dBm
10 dB/div Log
ΔMkr1 16.50 MHz
-1.08 dB
Center Freq 2.462000000 GHz
Start Freq 2.449500000 GHz
Stop Freq 2.474500000 GHz
CF Step 2.500000 MHz Auto Man
Freq Offset 0 Hz
Center 2.46200 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 25.00 MHz
Sweep 2.40 ms (601 pts)

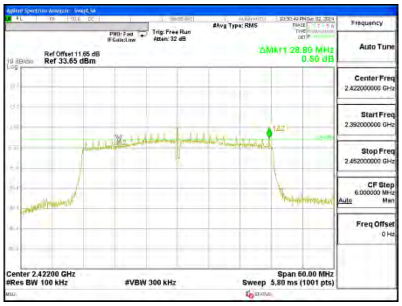
NOTE:

802.11n HT40 TEST RESULT TABLE

Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	Minimum Limit (MHz)
2422	28.80	35.22	0.5
2437	36.06	36.42	0.5
2452	35.10	35.28	0.5
Worst	28.80		

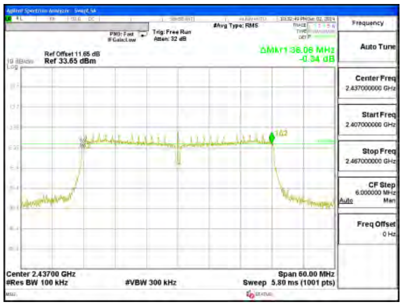
CHAIN 0

LOW CHANNEL



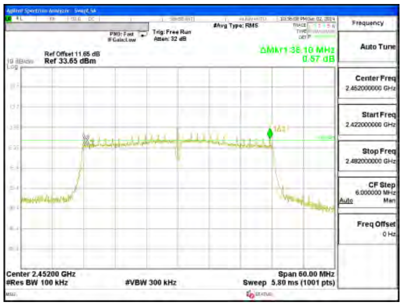
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 32 dB
#Avg Type: RMS
Ref Offset 11.65 dB
Ref 33.65 dBm
10 dB/div Log
ΔMkr1 28.80 MHz
0.50 dB
Center Freq 2.422000000 GHz
Start Freq 2.392000000 GHz
Stop Freq 2.452000000 GHz
CF Step 6.000000 MHz Auto Man
Freq Offset 0 Hz
Center 2.42200 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 60.00 MHz
Sweep 5.80 ms (1001 pts)

MID CHANNEL



PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 32 dB
#Avg Type: RMS
Ref Offset 11.65 dB
Ref 33.65 dBm
10 dB/div Log
ΔMkr1 36.06 MHz
-0.34 dB
Center Freq 2.437000000 GHz
Start Freq 2.407000000 GHz
Stop Freq 2.467000000 GHz
CF Step 6.000000 MHz Auto Man
Freq Offset 0 Hz
Center 2.43700 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 60.00 MHz
Sweep 5.80 ms (1001 pts)

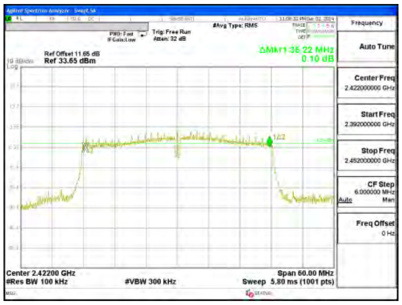
HIGH CHANNEL



PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 32 dB
#Avg Type: RMS
Ref Offset 11.65 dB
Ref 33.65 dBm
10 dB/div Log
ΔMkr1 35.10 MHz
0.57 dB
Center Freq 2.452000000 GHz
Start Freq 2.422000000 GHz
Stop Freq 2.482000000 GHz
CF Step 6.000000 MHz Auto Man
Freq Offset 0 Hz
Center 2.45200 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 60.00 MHz
Sweep 5.80 ms (1001 pts)

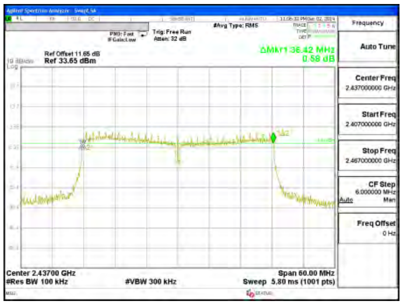
CHAIN 1

LOW CHANNEL



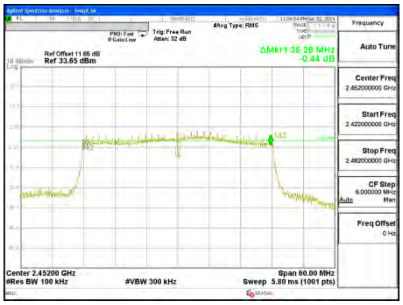
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 32 dB
#Avg Type: RMS
Ref Offset 11.65 dB
Ref 33.65 dBm
10 dB/div Log
ΔMkr1 35.22 MHz
0.10 dB
Center Freq 2.422000000 GHz
Start Freq 2.392000000 GHz
Stop Freq 2.452000000 GHz
CF Step 6.000000 MHz Auto Man
Freq Offset 0 Hz
Center 2.42200 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 60.00 MHz
Sweep 5.80 ms (1001 pts)

MID CHANNEL



PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 32 dB
#Avg Type: RMS
Ref Offset 11.65 dB
Ref 33.65 dBm
10 dB/div Log
ΔMkr1 36.42 MHz
0.58 dB
Center Freq 2.437000000 GHz
Start Freq 2.407000000 GHz
Stop Freq 2.467000000 GHz
CF Step 6.000000 MHz Auto Man
Freq Offset 0 Hz
Center 2.43700 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 60.00 MHz
Sweep 5.80 ms (1001 pts)

HIGH CHANNEL



PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 32 dB
#Avg Type: RMS
Ref Offset 11.65 dB
Ref 33.65 dBm
10 dB/div Log
ΔMkr1 35.28 MHz
-0.44 dB
Center Freq 2.452000000 GHz
Start Freq 2.422000000 GHz
Stop Freq 2.482000000 GHz
CF Step 6.000000 MHz Auto Man
Freq Offset 0 Hz
Center 2.45200 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 60.00 MHz
Sweep 5.80 ms (1001 pts)

NOTE:

11.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

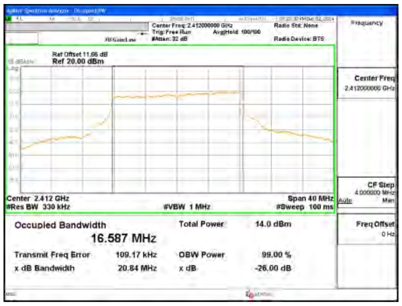
11.2.1. 99% BANDWIDTH PLOTS AND TABLE

802.11n HT20 TEST RESULT TABLE

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	2412	16.59	16.65
Mid	2437	16.99	16.65
High	2462	16.62	16.59

CHAIN 0

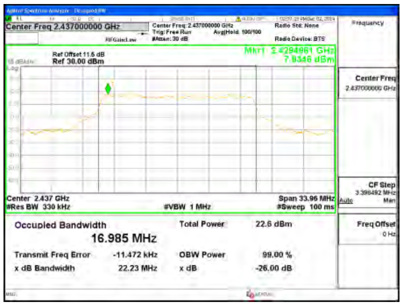
LOW CHANNEL



Center 2.412 GHz
#Res BW 330 kHz #VBW 1 MHz Span 40 MHz #Sweep 100 ms

Occupied Bandwidth 16.587 MHz
Total Power 14.0 dBm
Transmit Freq Error 109.17 kHz
OBW Power 99.00 %
x dB Bandwidth 20.84 MHz
x dB -26.00 dB

MID CHANNEL

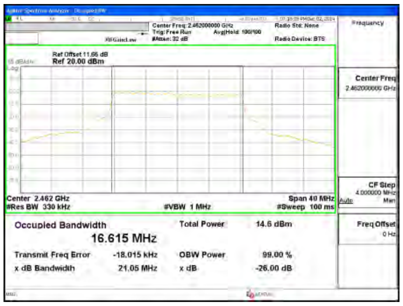


Center Freq 2.437000000 GHz
Ref Offset 11.6 dB
Ref 30.00 dBm
Mkr1 2.4294961 GHz 7.9346 dBm

Center 2.437 GHz
#Res BW 330 kHz #VBW 1 MHz Span 33.96 MHz #Sweep 100 ms

Occupied Bandwidth 16.985 MHz
Total Power 22.6 dBm
Transmit Freq Error -11.472 kHz
OBW Power 99.00 %
x dB Bandwidth 22.23 MHz
x dB -26.00 dB

HIGH CHANNEL

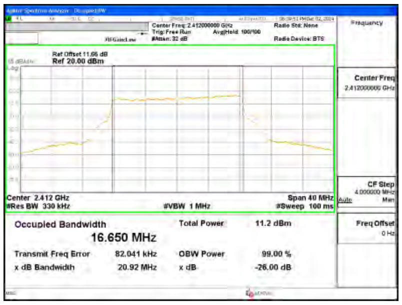


Center 2.462 GHz
#Res BW 330 kHz #VBW 1 MHz Span 40 MHz #Sweep 100 ms

Occupied Bandwidth 16.615 MHz
Total Power 14.6 dBm
Transmit Freq Error -18.015 kHz
OBW Power 99.00 %
x dB Bandwidth 21.05 MHz
x dB -26.00 dB

CHAIN 1

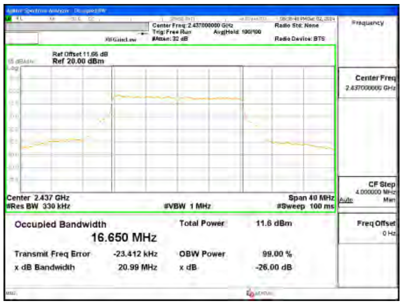
LOW CHANNEL



Center 2.412 GHz
#Res BW 330 kHz #VBW 1 MHz Span 40 MHz #Sweep 100 ms

Occupied Bandwidth 16.650 MHz
Total Power 11.2 dBm
Transmit Freq Error 82.041 kHz
OBW Power 99.00 %
x dB Bandwidth 20.92 MHz
x dB -26.00 dB

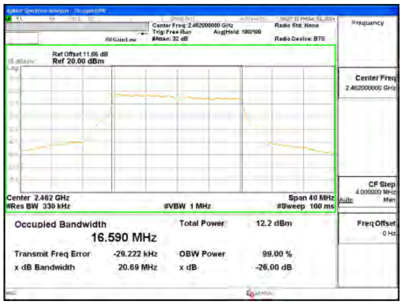
MID CHANNEL



Center 2.437 GHz
#Res BW 330 kHz #VBW 1 MHz Span 40 MHz #Sweep 100 ms

Occupied Bandwidth 16.650 MHz
Total Power 11.6 dBm
Transmit Freq Error -23.412 kHz
OBW Power 99.00 %
x dB Bandwidth 20.99 MHz
x dB -26.00 dB

HIGH CHANNEL



Center 2.462 GHz
#Res BW 330 kHz #VBW 1 MHz Span 40 MHz #Sweep 100 ms

Occupied Bandwidth 16.590 MHz
Total Power 12.2 dBm
Transmit Freq Error -29.222 kHz
OBW Power 99.00 %
x dB Bandwidth 20.69 MHz
x dB -26.00 dB

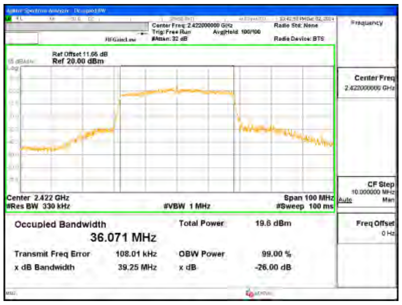
NOTE:

802.11n HT40 TEST RESULT TABLE

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	2422	36.07	36.10
Mid	2437	36.43	36.37
High	2452	36.23	36.32

CHAIN 0

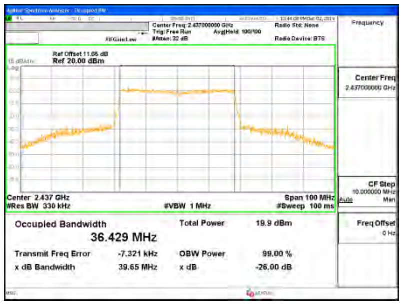
LOW CHANNEL



Center 2.422 GHz
#Res BW 330 kHz #VBW 1 MHz Span 100 MHz #Sweep 100 ms

Occupied Bandwidth 36.071 MHz
Total Power 19.6 dBm
Transmit Freq Error 108.01 kHz
OBW Power 99.00 %
x dB Bandwidth 39.25 MHz
x dB -26.00 dB

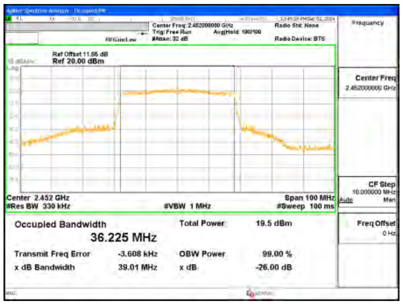
MID CHANNEL



Center 2.437 GHz
#Res BW 330 kHz #VBW 1 MHz Span 100 MHz #Sweep 100 ms

Occupied Bandwidth 36.429 MHz
Total Power 19.9 dBm
Transmit Freq Error -7.321 kHz
OBW Power 99.00 %
x dB Bandwidth 39.65 MHz
x dB -26.00 dB

HIGH CHANNEL

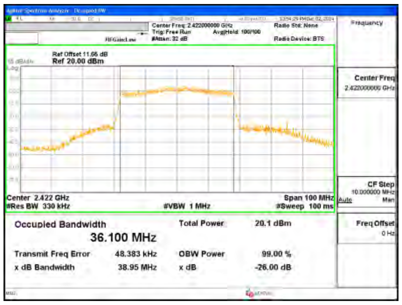


Center 2.452 GHz
#Res BW 330 kHz #VBW 1 MHz Span 100 MHz #Sweep 100 ms

Occupied Bandwidth 36.225 MHz
Total Power 19.5 dBm
Transmit Freq Error -3.608 kHz
OBW Power 99.00 %
x dB Bandwidth 39.01 MHz
x dB -26.00 dB

CHAIN 1

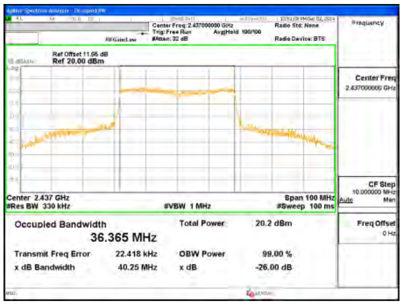
LOW CHANNEL



Center 2.422 GHz
#Res BW 330 kHz #VBW 1 MHz Span 100 MHz #Sweep 100 ms

Occupied Bandwidth 36.100 MHz
Total Power 20.1 dBm
Transmit Freq Error 48.383 kHz
OBW Power 99.00 %
x dB Bandwidth 38.95 MHz
x dB -26.00 dB

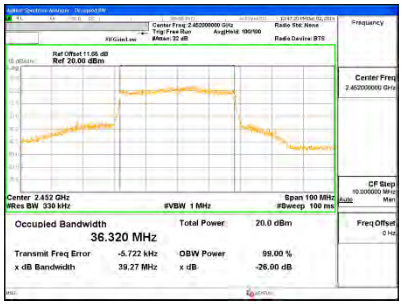
MID CHANNEL



Center 2.437 GHz
#Res BW 330 kHz #VBW 1 MHz Span 100 MHz #Sweep 100 ms

Occupied Bandwidth 36.365 MHz
Total Power 20.2 dBm
Transmit Freq Error 22.418 kHz
OBW Power 99.00 %
x dB Bandwidth 40.25 MHz
x dB -26.00 dB

HIGH CHANNEL



Center 2.452 GHz
#Res BW 330 kHz #VBW 1 MHz Span 100 MHz #Sweep 100 ms

Occupied Bandwidth 36.320 MHz
Total Power 20.0 dBm
Transmit Freq Error -5.722 kHz
OBW Power 99.00 %
x dB Bandwidth 39.27 MHz
x dB -26.00 dB

NOTE:

11.1. OUTPUT POWER

LIMITS

FCC §15.247

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

DIRECTIONAL ANTENNA GAIN

The TX chains are correlated and the antenna gain is unequal among the chains. The directional gain is:

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
3.36	0.85	5.21

RESULTS

11.1.1. 802.11n HT20 MODE IN THE 2.4 GHz BAND

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	2412	5.21	30.00	30	36	30.00
Mid	2437	5.21	30.00	30	36	30.00
High	2462	5.21	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margi (dB)
1	2412	14.60	14.10	17.37	30.00	-12.63
2	2417	15.50	15.50	18.51	30.00	-11.49
3	2422	17.70	17.30	20.51	30.00	-9.49
6	2437	17.30	17.30	20.31	30.00	-9.69
9	2452	17.35	17.84	20.61	30.00	-9.39
10	2457	16.87	17.54	20.23	30.00	-9.77
11	2462	13.00	13.00	16.01	30.00	-13.99

Note: the power readings above were measured with gated method, and the measurement was taken only during the ON time. No duty cycle correction was necessary.

11.1.2. 802.11n HT40 MODE IN THE 2.4 GHz BAND

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	2422	5.21	30.00	30	36	30.00
Mid	2437	5.21	30.00	30	36	30.00
High	2452	5.21	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margi (dB)
Low	2422	12.00	12.00	15.01	30.00	-14.99
Mid	2437	13.40	13.40	16.41	30.00	-13.59
High	2452	13.00	13.00	16.01	30.00	-13.99

Note: the power readings above were measured with gated method, and the measurement was taken only during the ON time. No duty cycle correction was necessary.

11.2. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

RESULTS

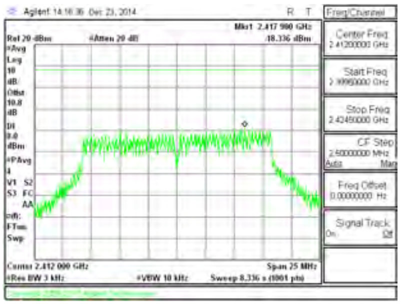
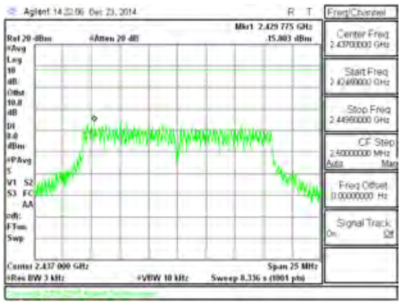
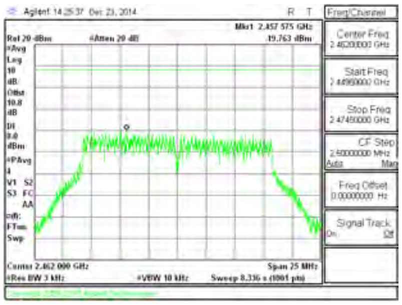
11.2.1. POWER SPECTRAL DENSITY PLOTS AND TABLE

802.11n HT20 TEST RESULT TABLE

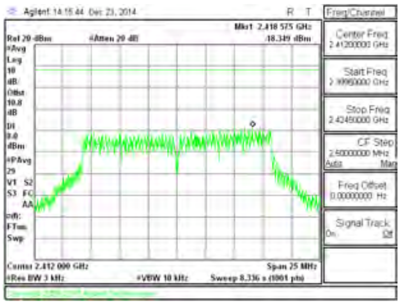
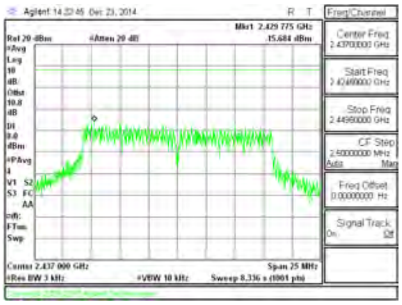
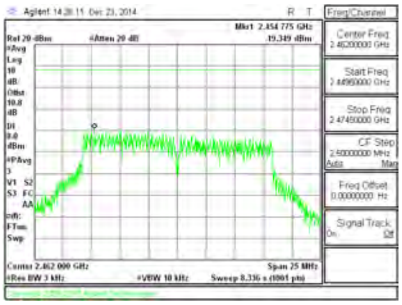
PSD Results

Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Chain 1 Meas (dBm)	Total PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-18.34	-18.35	-15.33	8.0	-23.3
Mid	2437	-15.80	-15.68	-12.73	8.0	-20.7
High	2462	-19.76	-16.92	-15.10	8.0	-23.1

CHAIN 0

LOW CHANNEL	MID CHANNEL	HIGH CHANNEL
 Agilent Mkr1 2.417 900 GHz -18.336 dBm Ref 20 dBm #Atten 20 dB Center 2.412 000 GHz Span 25 MHz #Res BW 3 kHz #VBW 10 kHz Sweep 8.336 s (1001 pts) Freq/Channel Center Freq Start Freq Stop Freq CF Step Freq Offset Signal Track	 Agilent Mkr1 2.429 775 GHz -15.803 dBm Ref 20 dBm #Atten 20 dB Center 2.437 000 GHz Span 25 MHz #Res BW 3 kHz #VBW 10 kHz Sweep 8.336 s (1001 pts) Freq/Channel Center Freq Start Freq Stop Freq CF Step Freq Offset Signal Track	 Agilent Mkr1 2.457 575 GHz -19.763 dBm Ref 20 dBm #Atten 20 dB Center 2.462 000 GHz Span 25 MHz #Res BW 3 kHz #VBW 10 kHz Sweep 8.336 s (1001 pts) Freq/Channel Center Freq Start Freq Stop Freq CF Step Freq Offset Signal Track

CHAIN 1

LOW CHANNEL	MID CHANNEL	HIGH CHANNEL
 Agilent Mkr1 2.418 575 GHz -18.349 dBm Ref 20 dBm #Atten 20 dB Center 2.412 000 GHz Span 25 MHz #Res BW 3 kHz #VBW 10 kHz Sweep 8.336 s (1001 pts) Freq/Channel Center Freq Start Freq Stop Freq CF Step Freq Offset Signal Track	 Agilent Mkr1 2.429 775 GHz -15.684 dBm Ref 20 dBm #Atten 20 dB Center 2.437 000 GHz Span 25 MHz #Res BW 3 kHz #VBW 10 kHz Sweep 8.336 s (1001 pts) Freq/Channel Center Freq Start Freq Stop Freq CF Step Freq Offset Signal Track	 Agilent Mkr1 2.454 775 GHz -19.349 dBm Ref 20 dBm #Atten 20 dB Center 2.462 000 GHz Span 25 MHz #Res BW 3 kHz #VBW 10 kHz Sweep 8.336 s (1001 pts) Freq/Channel Center Freq Start Freq Stop Freq CF Step Freq Offset Signal Track

NOTE:

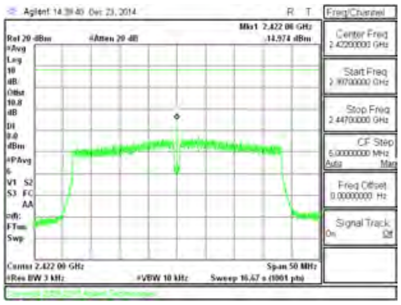
802.11n HT40 TEST RESULT TABLE

PSD Results

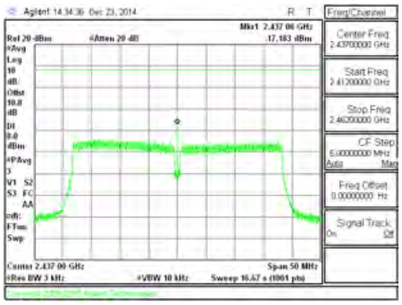
Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Chain 1 Meas (dBm)	Total PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2422	-14.97	-11.67	-10.00	8.0	-18.0
Mid	2437	-17.18	-13.49	-11.95	8.0	-19.9
High	2452	-17.20	-13.90	-12.23	8.0	-20.2

CHAIN 0

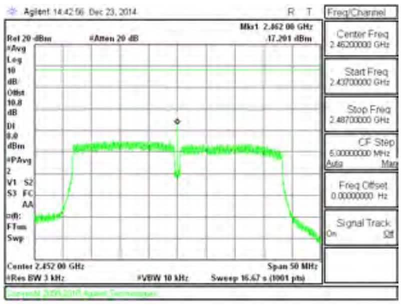
LOW CHANNEL



MID CHANNEL

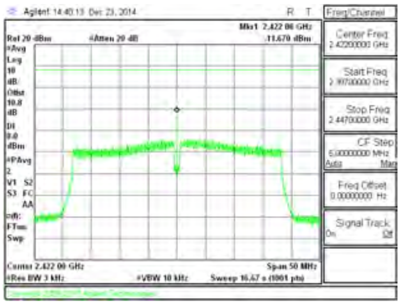


HIGH CHANNEL

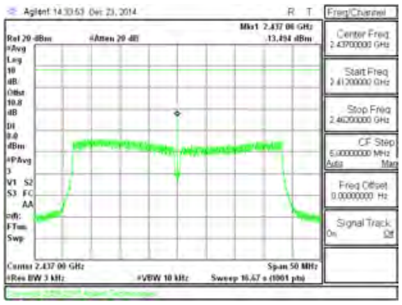


CHAIN 1

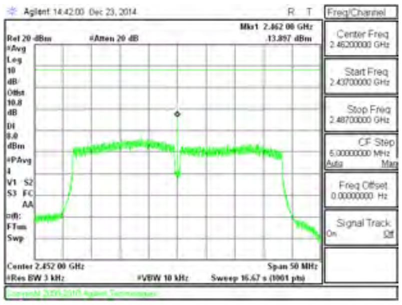
LOW CHANNEL



MID CHANNEL



HIGH CHANNEL



NOTE:

11.3. CONDUCTED SPURIOUS AND OUT-OF-BAND EMISSIONS

LIMITS

FCC §15.247 (d)

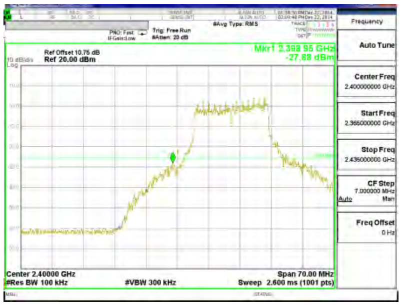
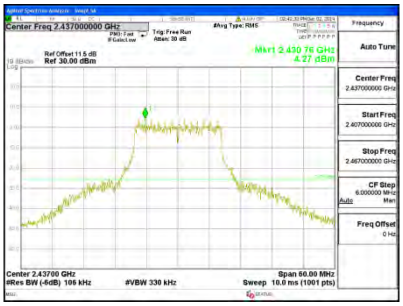
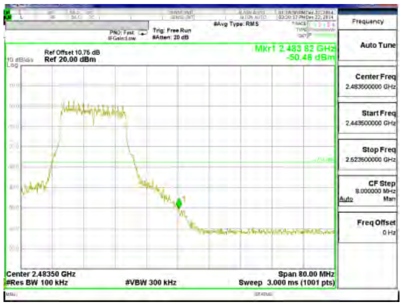
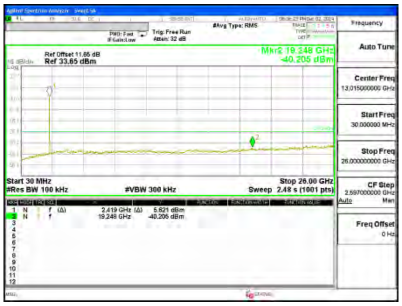
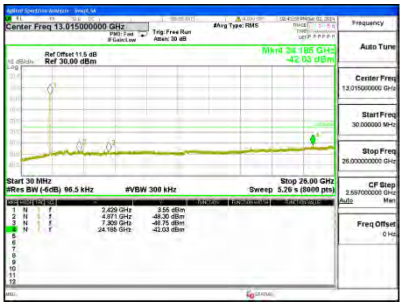
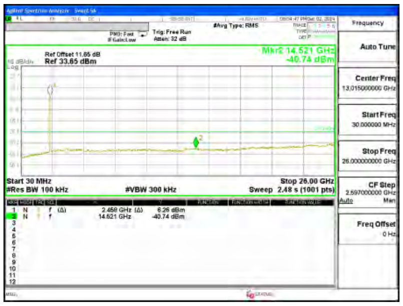
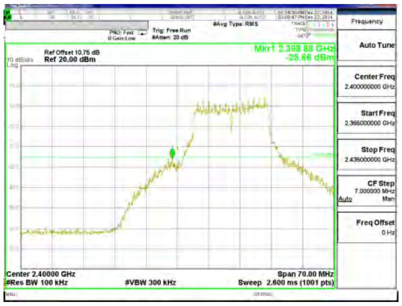
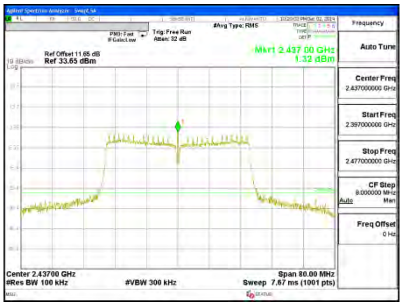
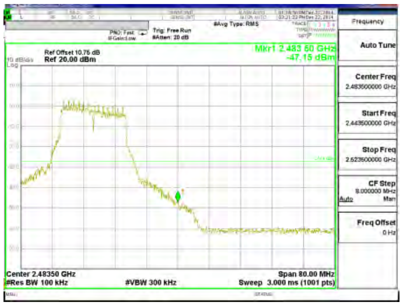
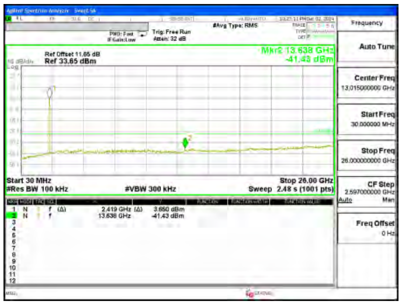
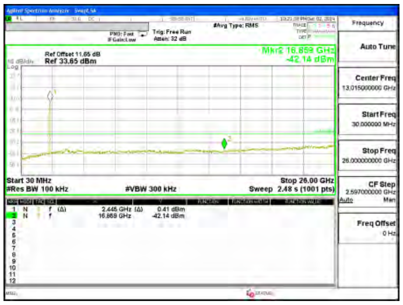
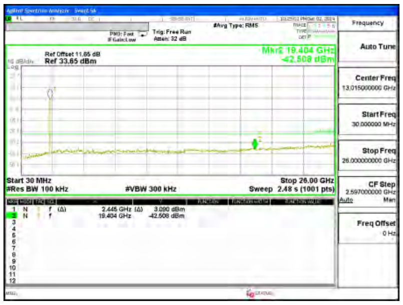
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

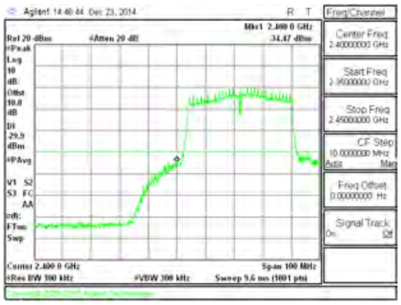
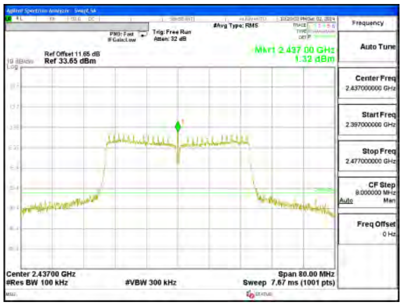
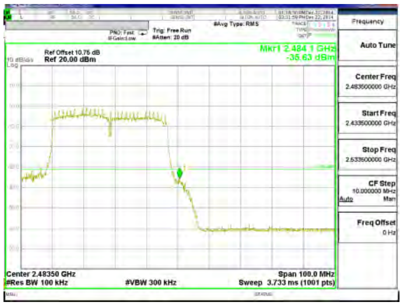
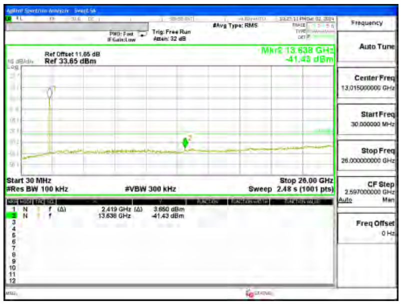
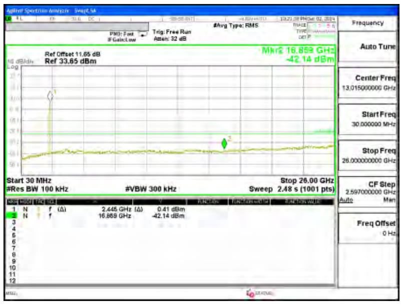
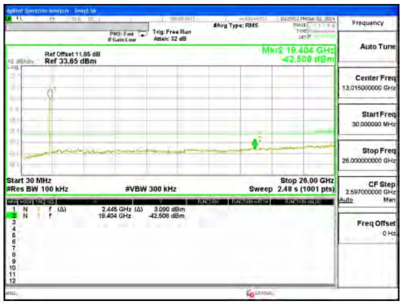
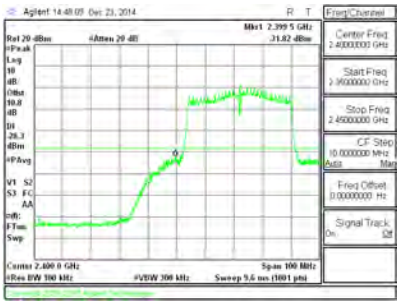
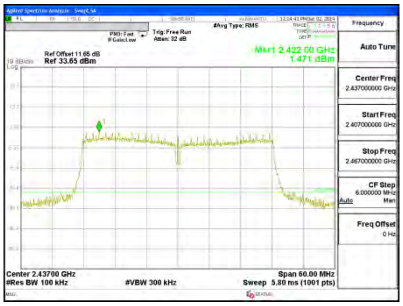
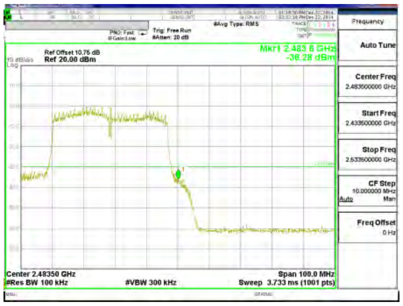
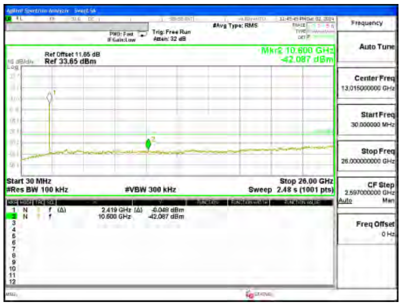
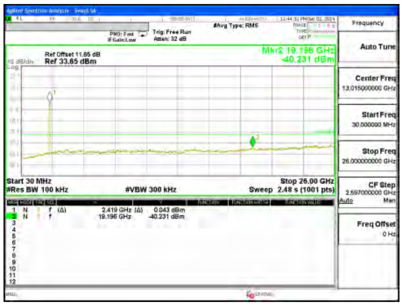
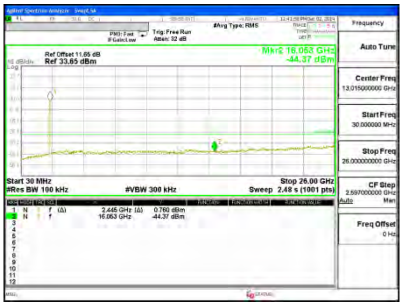
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer with RBW = 100 kHz, VBW = 300 kHz, peak detector, and max hold. Measurements utilizing these settings are made of the in-band reference level, bandedge (where measurements to the general radiated limits will not be made) and out-of-band emissions.

RESULTS

11.3.1. BANDEDGE AND SPURIOUS EMISSIONS PLOTS

802.11n HT20 TEST RESULT TABLE		
CHAIN 0		
LOW CHANNEL BANDEDGE	MID CHANNEL REFERENCE	HIGH CHANNEL BANDEDGE
 Ref Offset 10.75 dB Ref 20.00 dBm Mkr1 2.399 95 GHz -27.88 dBm Center 2.40000 GHz #Res BW 100 kHz #VBW 300 kHz Span 70.00 MHz Sweep 2.600 ms (1001 pts)	 Center Freq 2.437000000 GHz Ref Offset 11.5 dB Ref 30.00 dBm Mkr1 2.430 76 GHz 4.27 dBm Center 2.43700 GHz #Res BW (-6dB) 100 kHz #VBW 330 kHz Span 60.00 MHz Sweep 10.0 ms (1001 pts)	 Ref Offset 10.75 dB Ref 20.00 dBm Mkr1 2.483 82 GHz -50.46 dBm Center 2.48350 GHz #Res BW 100 kHz #VBW 300 kHz Span 80.00 MHz Sweep 3.000 ms (1001 pts)
LOW CHANNEL SPURIOUS	MID CHANNEL SPURIOUS	HIGH CHANNEL SPURIOUS
 Ref Offset 11.65 dB Ref 33.65 dBm Mkr2 19.248 GHz -40.205 dBm Start 30 MHz #Res BW 100 kHz #VBW 300 kHz Stop 26.00 GHz Sweep 2.48 s (1001 pts) 1 N f (Δ) 2.419 GHz (Δ) 5.821 dBm 2 N f 19.248 GHz -40.205 dBm	 Center Freq 13.015000000 GHz Ref Offset 11.5 dB Ref 30.00 dBm Mkr4 24.185 GHz -42.03 dBm Start 30 MHz #Res BW (-6dB) 96.5 kHz #VBW 300 kHz Stop 26.00 GHz Sweep 5.26 s (8000 pts) 1 N f 2.429 GHz 3.56 dBm 2 N f 4.871 GHz -48.30 dBm 3 N f 7.309 GHz -46.75 dBm 4 N f 24.185 GHz -42.03 dBm	 Ref Offset 11.65 dB Ref 33.65 dBm Mkr2 14.521 GHz -40.74 dBm Start 30 MHz #Res BW 100 kHz #VBW 300 kHz Stop 26.00 GHz Sweep 2.48 s (1001 pts) 1 N f (Δ) 2.468 GHz (Δ) 6.26 dBm 2 N f 14.521 GHz -40.74 dBm
CHAIN 1		
LOW CHANNEL BANDEDGE	MID CHANNEL REFERENCE	HIGH CHANNEL BANDEDGE
 Ref Offset 10.75 dB Ref 20.00 dBm Mkr1 2.399 88 GHz -25.66 dBm Center 2.40000 GHz #Res BW 100 kHz #VBW 300 kHz Span 70.00 MHz Sweep 2.600 ms (1001 pts)	 Ref Offset 11.65 dB Ref 33.65 dBm Mkr1 2.437 00 GHz 1.32 dBm Center 2.43700 GHz #Res BW 100 kHz #VBW 300 kHz Span 80.00 MHz Sweep 7.67 ms (1001 pts)	 Ref Offset 10.75 dB Ref 20.00 dBm Mkr1 2.483 60 GHz -47.15 dBm Center 2.48350 GHz #Res BW 100 kHz #VBW 300 kHz Span 80.00 MHz Sweep 3.000 ms (1001 pts)
LOW CHANNEL SPURIOUS	MID CHANNEL SPURIOUS	HIGH CHANNEL SPURIOUS
 Ref Offset 11.65 dB Ref 33.65 dBm Mkr2 13.638 GHz -41.43 dBm Start 30 MHz #Res BW 100 kHz #VBW 300 kHz Stop 26.00 GHz Sweep 2.48 s (1001 pts) 1 N f (Δ) 2.419 GHz (Δ) 3.650 dBm 2 N f 13.638 GHz -41.43 dBm	 Ref Offset 11.65 dB Ref 33.65 dBm Mkr2 16.859 GHz -42.14 dBm Start 30 MHz #Res BW 100 kHz #VBW 300 kHz Stop 26.00 GHz Sweep 2.48 s (1001 pts) 1 N f (Δ) 2.445 GHz (Δ) 0.41 dBm 2 N f 16.859 GHz -42.14 dBm	 Ref Offset 11.65 dB Ref 33.65 dBm Mkr2 19.404 GHz -42.508 dBm Start 30 MHz #Res BW 100 kHz #VBW 300 kHz Stop 26.00 GHz Sweep 2.48 s (1001 pts) 1 N f (Δ) 2.445 GHz (Δ) 3.090 dBm 2 N f 19.404 GHz -42.508 dBm

802.11n HT40 TEST RESULT TABLE		
CHAIN 0		
LOW CHANNEL BANDEDGE	MID CHANNEL REFERENCE	HIGH CHANNEL BANDEDGE
		
LOW CHANNEL SPURIOUS	MID CHANNEL SPURIOUS	HIGH CHANNEL SPURIOUS
		
CHAIN 1		
LOW CHANNEL BANDEDGE	MID CHANNEL REFERENCE	HIGH CHANNEL BANDEDGE
		
LOW CHANNEL SPURIOUS	MID CHANNEL SPURIOUS	HIGH CHANNEL SPURIOUS
		

12. RADIATED TEST RESULTS SISO 802.11b/g Chain 0

12.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane for below 1GHz and 150 cm for above 1GHz. The antenna to EUT distance is 3 meters.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements and add duty cycle factor for average measurements. Duty cycle factor= 10log (1/x) For this sample B mode = 0dB (duty cycle >98%); G mode = 0.3dB; N HT20 mode = 0.30dB; N HT40 mode=0.14dB.

The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

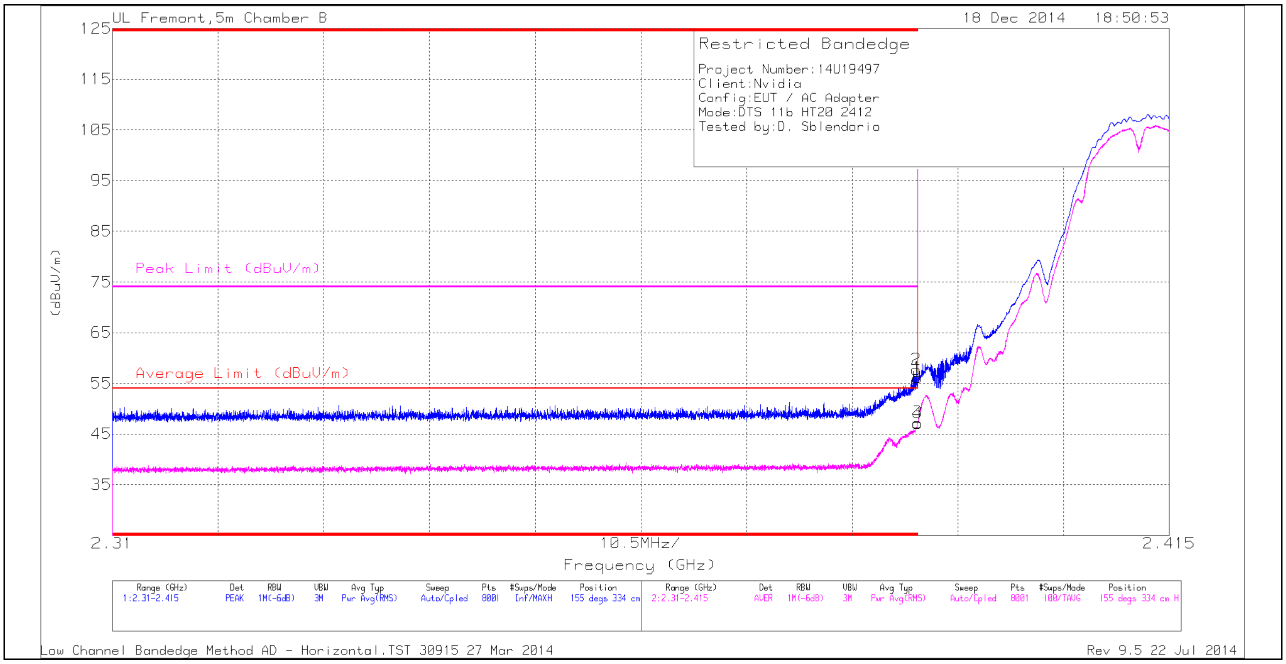
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

12.2. TRANSMITTER ABOVE 1 GHz

12.2.1. TX ABOVE 1 GHz 802.11b MODE IN THE 2.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

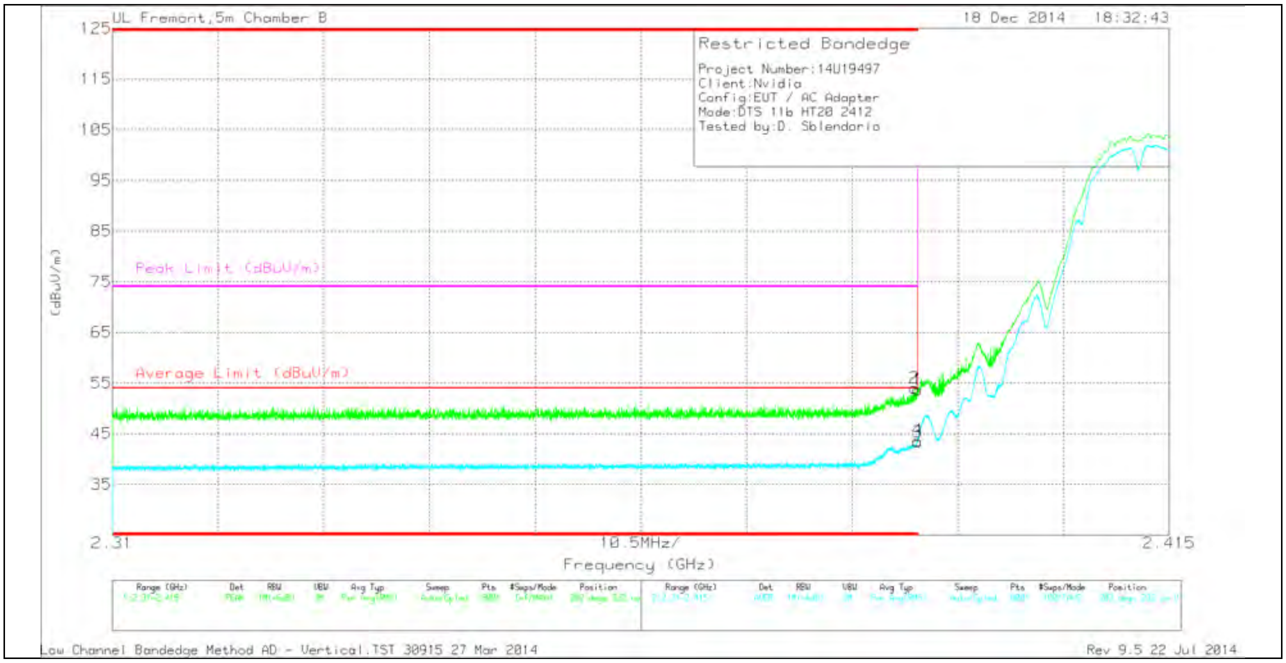
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	46.67	PK	32.1	-22.7	0	56.07	-	-	74	-17.93	155	334
2	* 2.39	48.33	PK	32.1	-22.7	0	57.73	-	-	74	-16.27	155	334
3	* 2.39	37.85	RMS	32.1	-22.7	0	47.25	54	-6.75	-	-	155	334
4	* 2.39	37.67	RMS	32.1	-22.7	0	47.07	54	-6.93	-	-	155	334

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	44.3	PK	32.1	-22.7	0	53.7	-	-	74	-20.3	202	232	V
2	* 2.39	44.64	PK	32.1	-22.7	0	54.04	-	-	74	-19.96	202	232	V
3	* 2.39	33.99	RMS	32.1	-22.7	0	43.39	54	-10.61	-	-	202	232	V
4	* 2.39	34.25	RMS	32.1	-22.7	0	43.65	54	-10.35	-	-	202	232	V

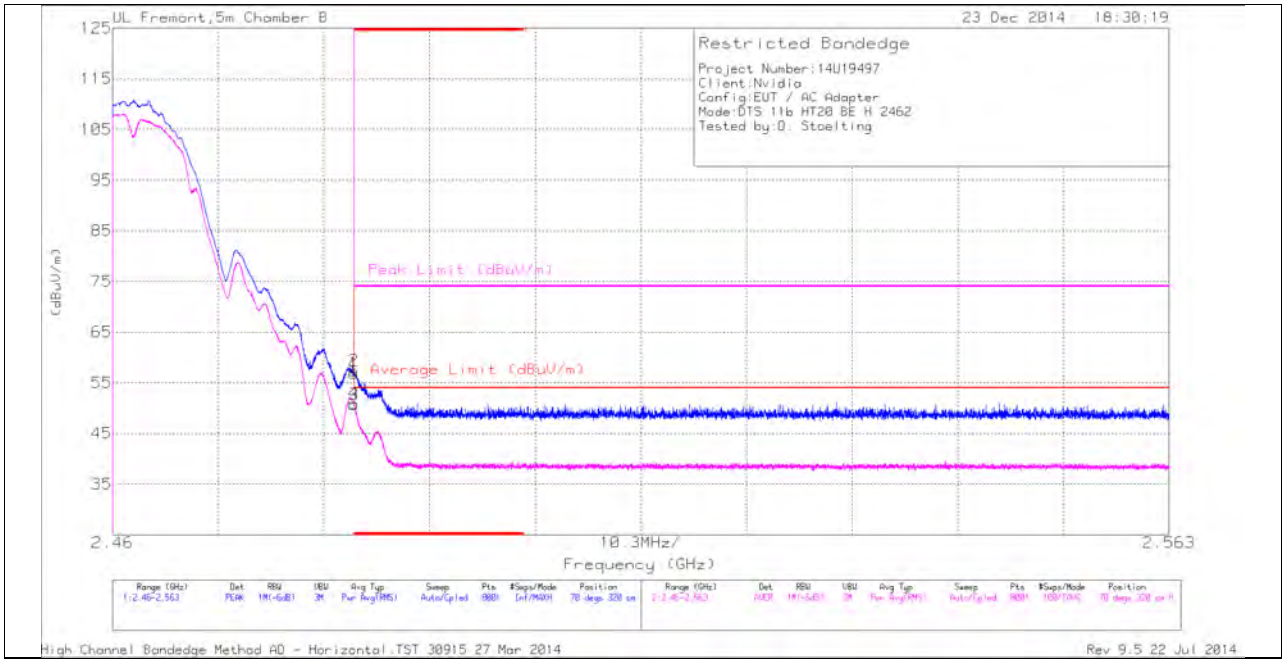
* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK - Peak detector

RMS - RMS detection

AUTHORIZED BANDEDGE (HIGH CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

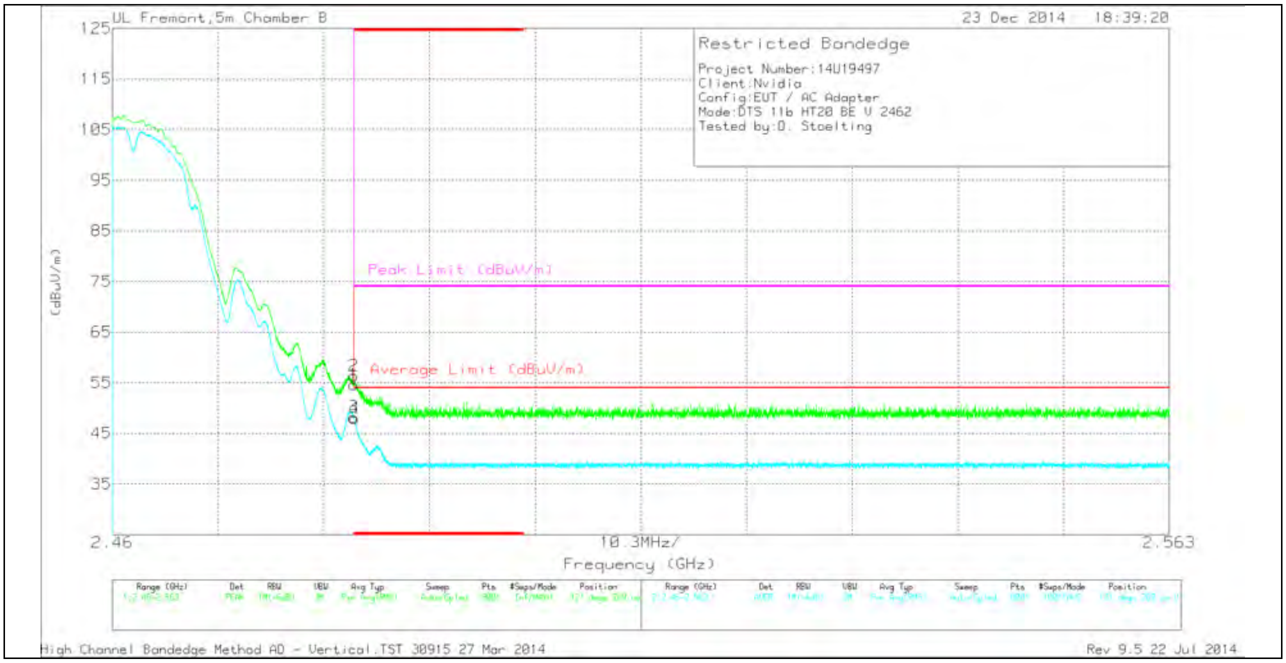
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	47.05	PK	32.4	-22.6	56.85	-	-	74	-17.15	70	320	H
2	* 2.484	47.55	PK	32.4	-22.6	57.35	-	-	74	-16.65	70	320	H
3	* 2.484	40.9	RMS	32.4	-22.6	50.7	54	-3.3	-	-	70	320	H
4	* 2.484	41.11	RMS	32.4	-22.6	50.91	54	-3.09	-	-	70	320	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	44.83	PK	32.4	-22.6	54.63	-	-	74	-19.37	121	269	V
2	* 2.484	46.53	PK	32.4	-22.6	56.33	-	-	74	-17.67	121	269	V
3	* 2.484	38.44	RMS	32.4	-22.6	48.24	54	-5.76	-	-	121	269	V
4	* 2.484	38.17	RMS	32.4	-22.6	47.97	54	-6.03	-	-	121	269	V

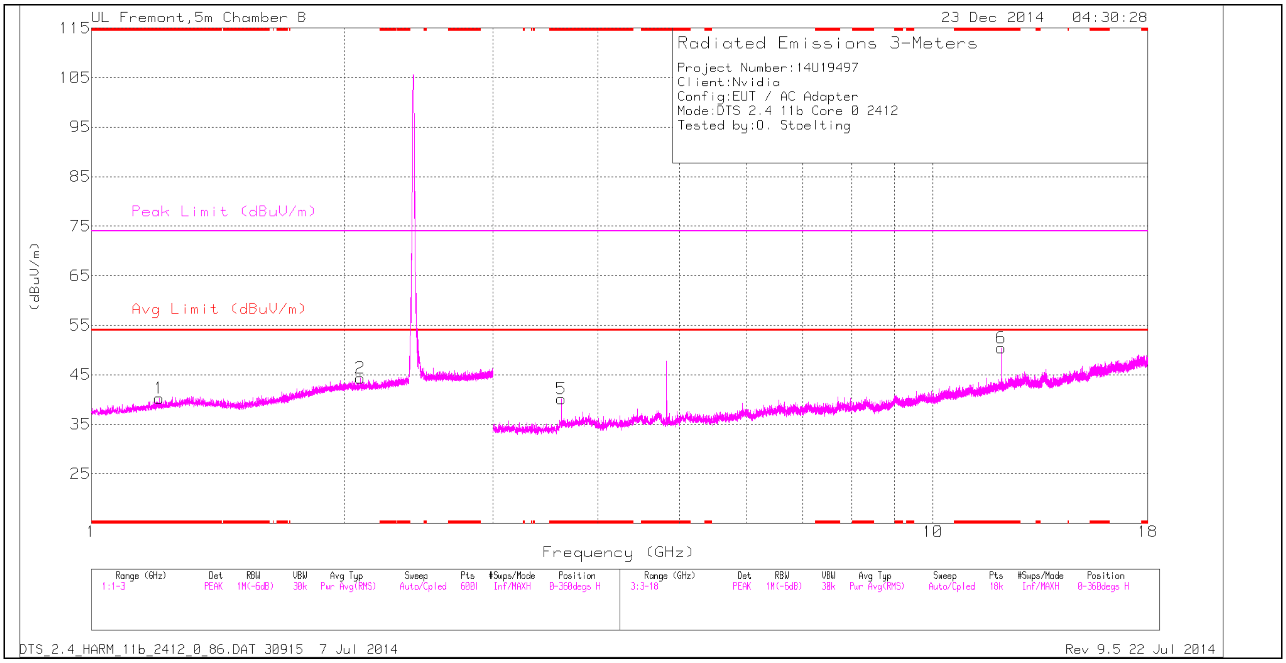
* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK - Peak detector

RMS - RMS detection

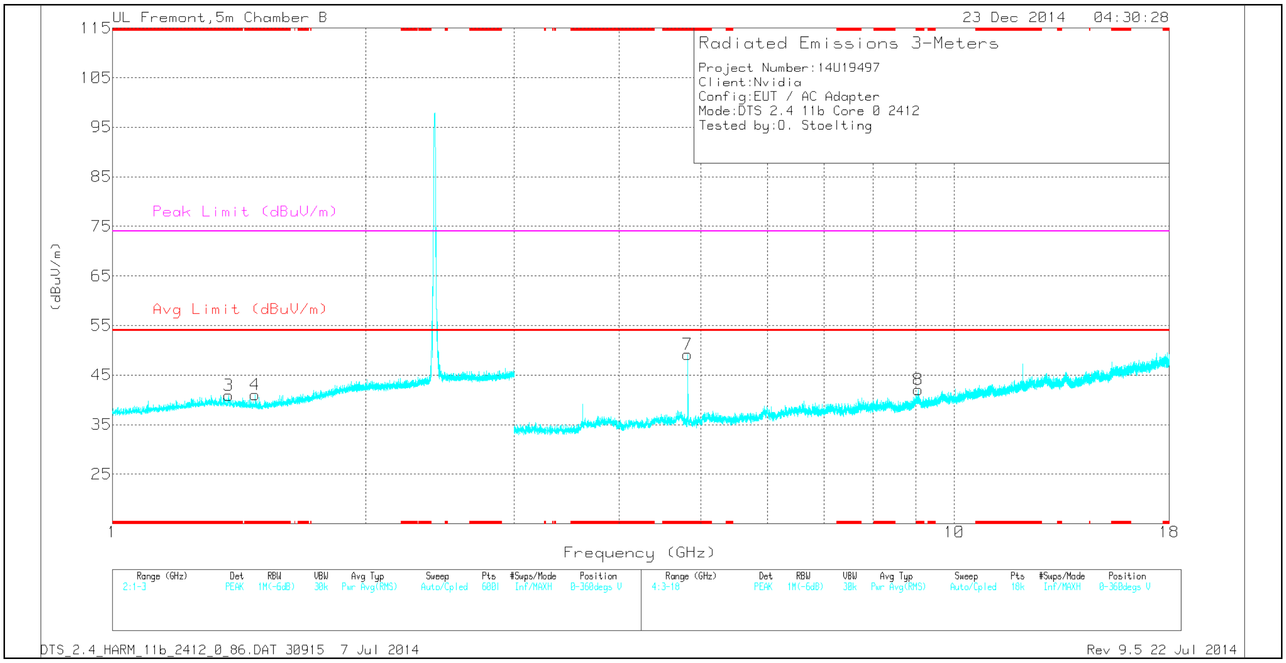
HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

LOW CHANNEL VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

LOW CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.204	36.46	PK	28.2	-24.4	40.26	-	-	74	-33.74	0-360	101	H
3	* 1.373	36.56	PK	28.6	-24.3	40.86	-	-	74	-33.14	0-360	200	V
4	* 1.478	37.07	PK	28	-24	41.07	-	-	74	-32.93	0-360	101	V
5	* 3.618	37.84	PK	33.2	-30.9	40.14	-	-	74	-33.86	0-360	199	H
6	* 12.061	34.21	PK	38.8	-22.6	50.41	-	-	74	-23.59	0-360	199	H
7	* 4.824	44.91	PK	34.2	-30	49.11	-	-	74	-24.89	0-360	199	V
8	* 9.065	30.09	PK	36.3	-24.4	41.99	-	-	74	-32.01	0-360	199	V
2	2.088	36.16	PK	31.3	-23.1	44.36	-	-	-	-	0-360	200	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK - Peak detector

Radiated Emissions

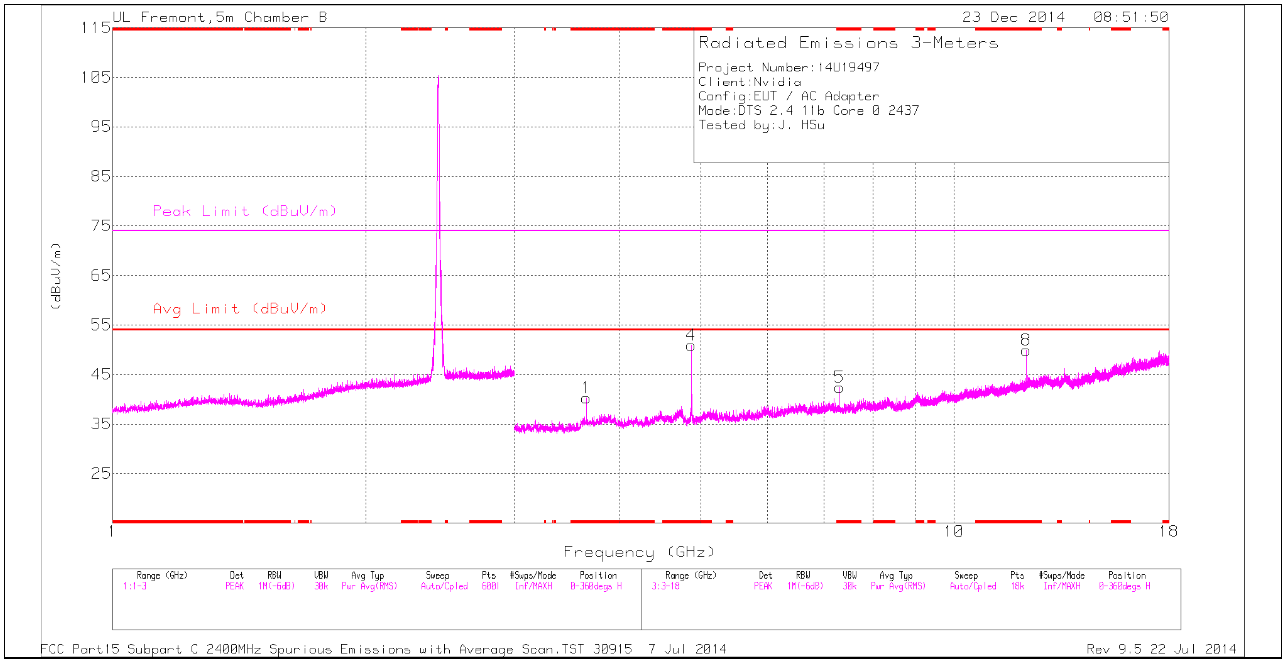
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 3.618	44.09	PK2	33.2	-30.9	46.39	-	-	74	-27.61	78	205	H
* 3.618	38.06	MAv1	33.2	-30.9	40.36	54	-13.64	-	-	78	205	H
* 12.06	40.52	PK2	38.8	-22.5	56.82	-	-	74	-17.18	349	159	H
* 12.059	33.94	MAv1	38.8	-22.5	50.24	54	-3.76	-	-	349	159	H
* 4.824	47.98	PK2	34.2	-30	52.18	-	-	74	-21.82	42	230	V
* 4.824	44.32	MAv1	34.2	-30	48.52	54	-5.48	-	-	42	230	V
* 9.064	37.02	PK2	36.3	-24.4	48.92	-	-	74	-25.08	227	124	V
* 9.065	25.12	MAv1	36.3	-24.4	37.02	54	-16.98	-	-	227	124	V

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

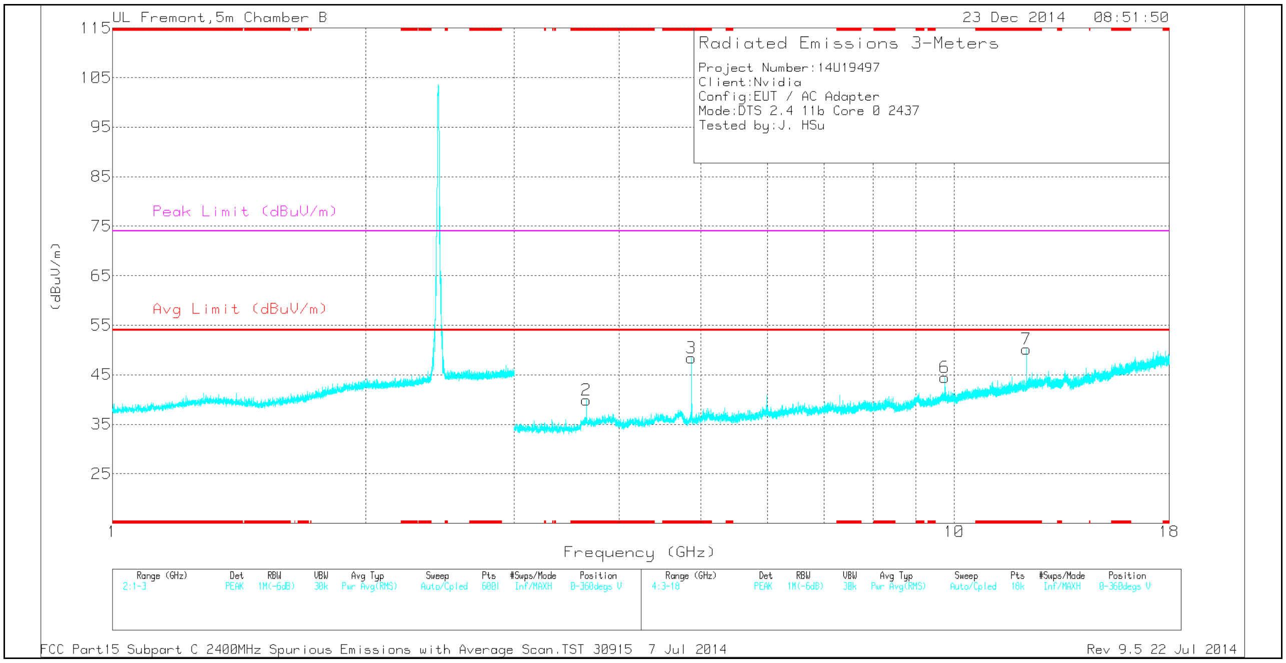
RMS - RMS detection

MID CHANNEL HORIZONTAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

MID CHANNEL VERTICAL



Range (GHz)	Det	RBW	VBW	Avg Typ	Sweep	Pts	#Swps/Mode	Position
2:1-3	PEAK	1M(-6dB)	30k	Pwr Avg(RMS)	Auto/Cpled	6001	Inf/MAXH	0-360degs V
4:3-18	PEAK	1M(-6dB)	30k	Pwr Avg(RMS)	Auto/Cpled	18k	Inf/MAXH	0-360degs V

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

MID CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 3.656	38.12	PK	33.2	-31	40.32	-	-	74	-33.68	0-360	199	H
4	* 4.874	47.31	PK	34.2	-30.6	50.91	-	-	74	-23.09	0-360	199	H
5	* 7.311	35.23	PK	35.6	-28.4	42.43	-	-	74	-31.57	0-360	199	H
8	* 12.184	33.57	PK	38.9	-22.5	49.97	-	-	74	-24.03	0-360	199	H
2	* 3.655	37.65	PK	33.2	-31	39.85	-	-	74	-34.15	0-360	101	V
3	* 4.874	44.84	PK	34.2	-30.6	48.44	-	-	74	-25.56	0-360	199	V
7	* 12.186	33.72	PK	38.9	-22.5	50.12	-	-	74	-23.88	0-360	199	V
6	9.748	31.76	PK	36.9	-24.2	44.46	-	-	-	-	0-360	101	V

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK - Peak detector

Radiated Emissions

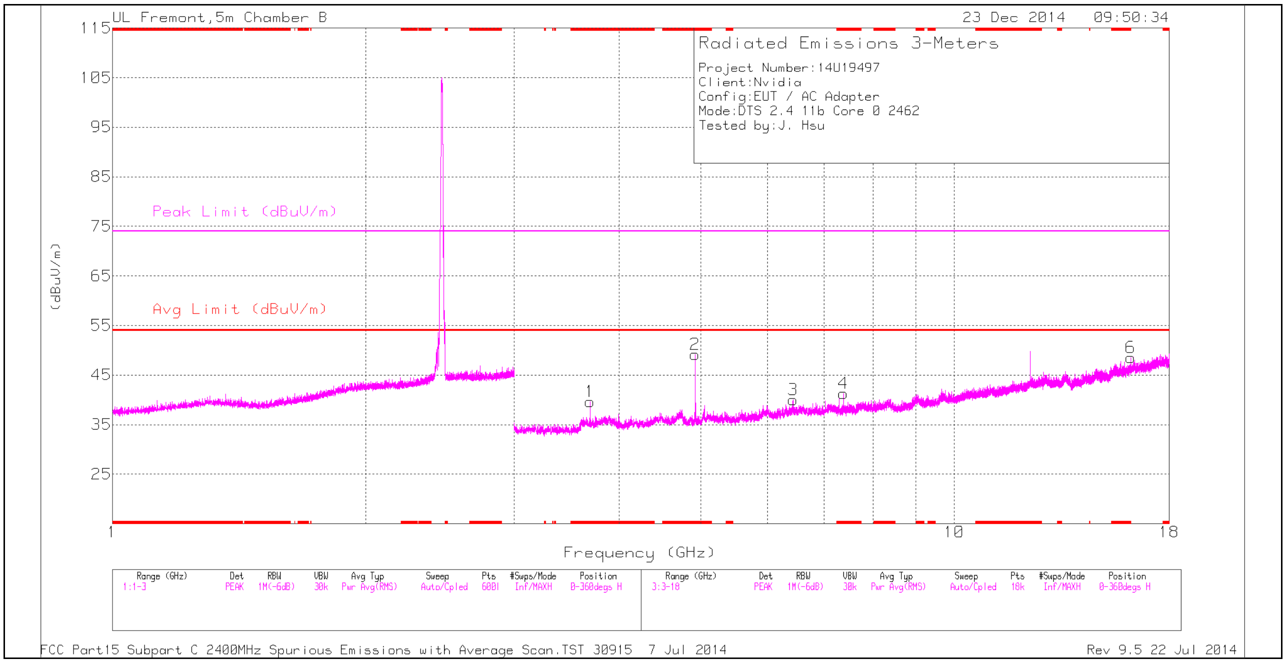
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.874	49.97	PK2	34.2	-30.6	53.57	-	-	74	-20.43	168	218	H
* 4.874	46.6	MAv1	34.2	-30.6	50.2	54	-3.8	-	-	168	218	H
* 7.311	42.47	PK2	35.6	-28.4	49.67	-	-	74	-24.33	57	136	H
* 7.311	33.57	MAv1	35.6	-28.4	40.77	54	-13.23	-	-	57	136	H
* 12.185	40.95	PK2	38.9	-22.5	57.35	-	-	74	-16.65	350	139	V
* 12.184	34.69	MAv1	38.9	-22.5	51.09	54	-2.91	-	-	350	139	V

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

RMS - RMS detection

HIGH CHANNEL HORIZONTAL



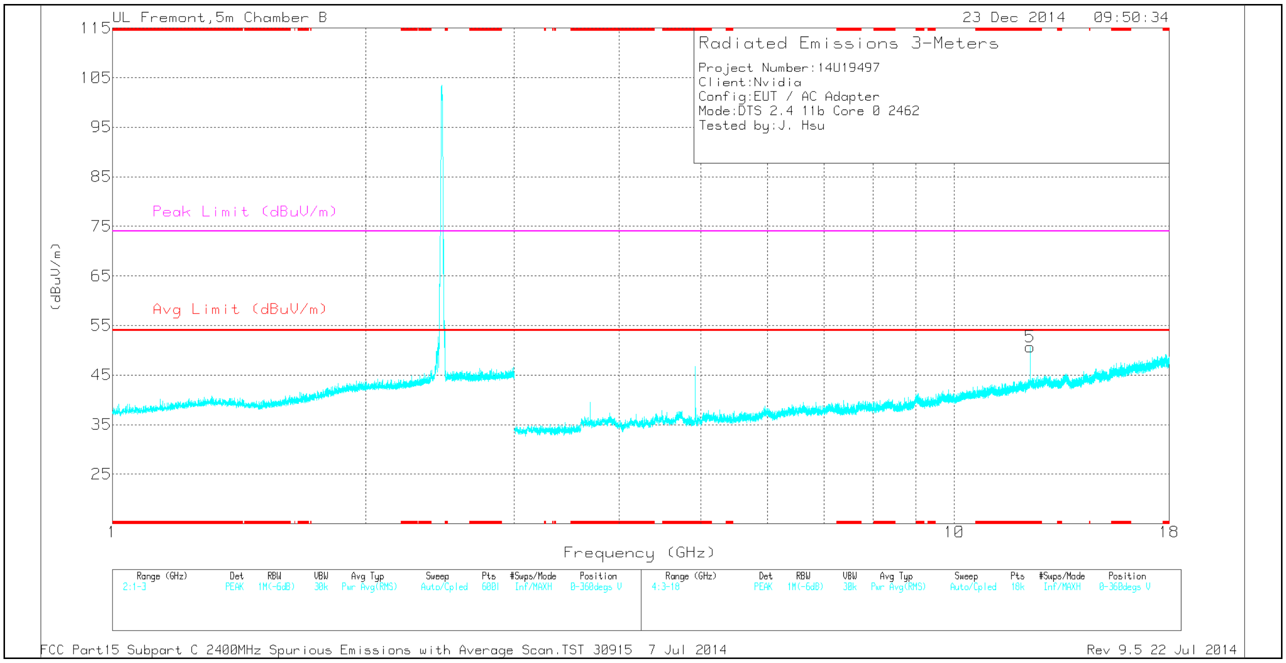
Radiated Emissions 3-Meters
Project Number:14U19497
Client:Nvidia
Config:EUT / AC Adapter
Mode:DTS 2.4 11b Core 0 2462
Tested by:J. Hsu

Range (GHz)	Det	RBW	VBW	Avg Typ	Sweep	Pts	#Swps/Mode	Position
1:1-3	PEAK	1M(-6dB)	30k	Pwr Avg(RMS)	Auto/Cpled	6001	Inf/MAXH	0-360degs H
3:3-18	PEAK	1M(-6dB)	30k	Pwr Avg(RMS)	Auto/Cpled	18k	Inf/MAXH	0-360degs H

FCC Part15 Subpart C 2400MHz Spurious Emissions with Average Scan.TST 30915 7 Jul 2014 Rev 9.5 22 Jul 2014

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

HIGH CHANNEL VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

HIGH CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 3.692	37.7	PK	33.3	-31.4	39.6	-	-	74	-34.4	0-360	199	H
2	* 4.924	45.89	PK	34.2	-30.9	49.19	-	-	74	-24.81	0-360	199	H
4	* 7.386	33.52	PK	35.6	-27.8	41.32	-	-	74	-32.68	0-360	199	H
5	* 12.309	33.69	PK	39	-22	50.69	-	-	74	-23.31	0-360	199	V
3	6.431	33.63	PK	35.6	-29.2	40.03	-	-	-	-	0-360	101	H
6	16.204	28.14	PK	41.1	-20.7	48.54	-	-	-	-	0-360	199	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.924	49.7	PK2	34.2	-30.9	53	-	-	74	-21	281	163	H
* 4.924	46.55	MAv1	34.2	-30.9	49.85	54	-4.15	-	-	281	163	H
* 12.31	39.92	PK2	39	-22	56.92	-	-	74	-17.08	349	143	V
* 12.309	33.19	MAv1	39	-22	50.19	54	-3.81	-	-	349	143	V

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

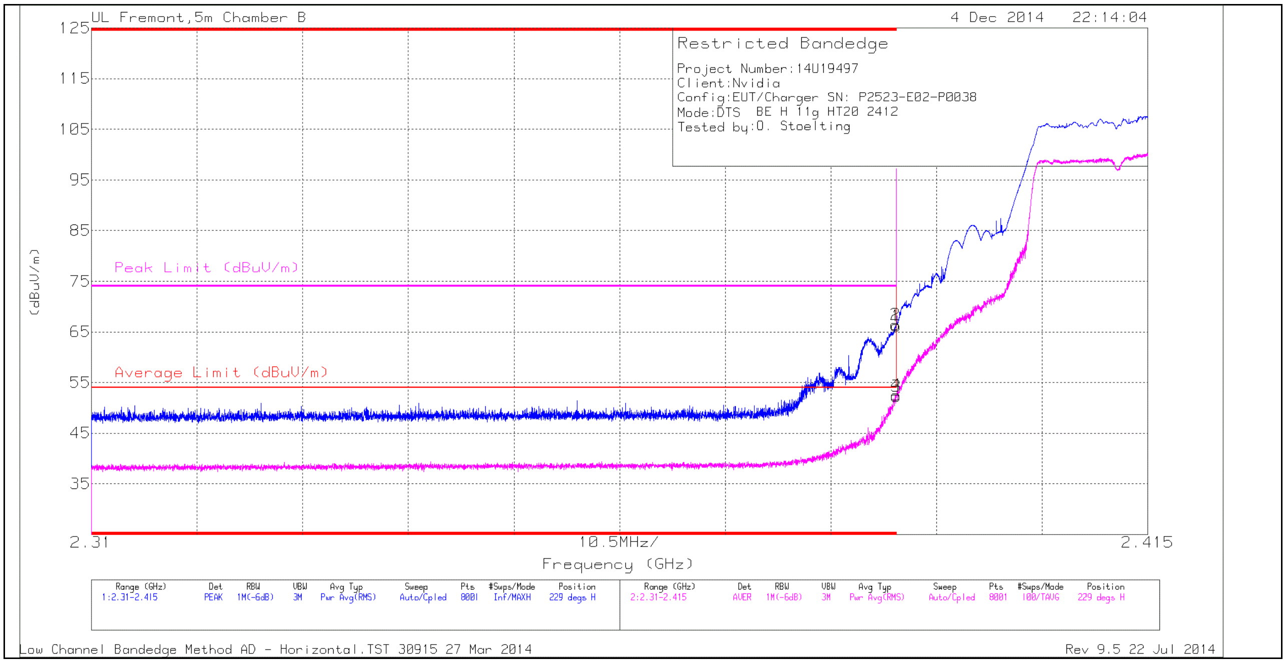
Pk - Peak detector

RMS - RMS detection

12.2.2. TX ABOVE 1 GHz 802.11g MODE IN THE 2.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

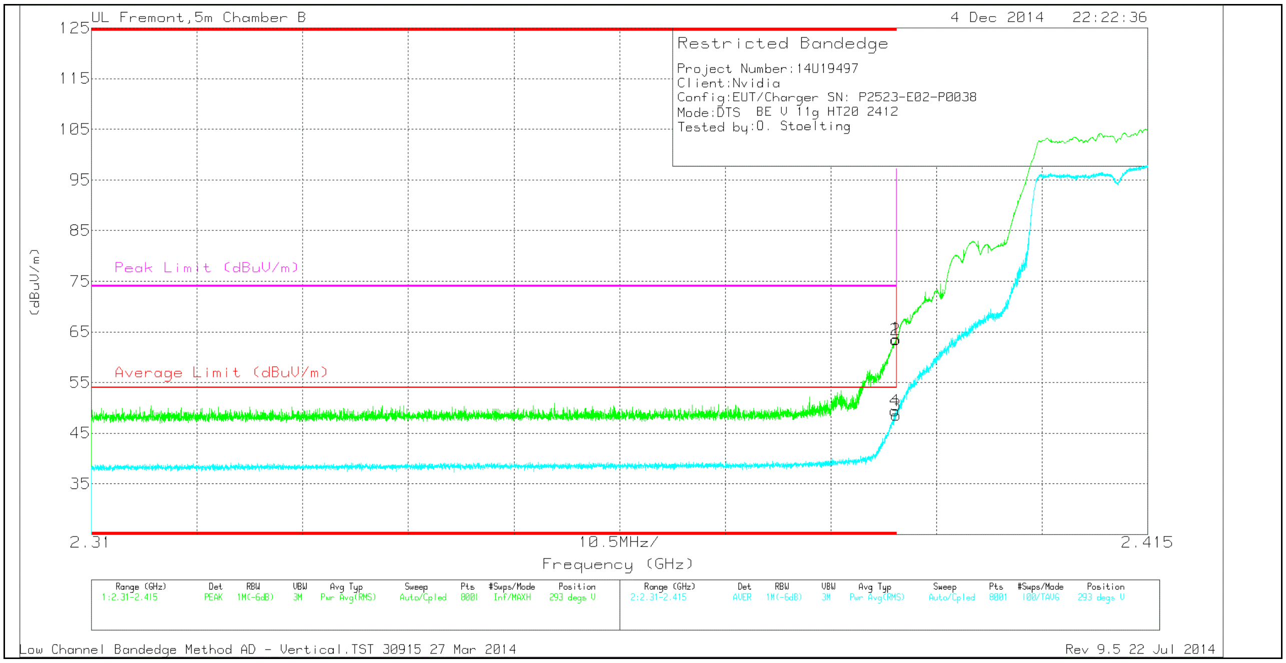
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Flt r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	56.84	PK	32.1	-22.7	0	66.24	-	-	74	-7.76	229	336	H
2	* 2.39	57.05	PK	32.1	-22.7	0	66.45	-	-	74	-7.55	229	336	H
3	* 2.39	42.64	RMS	32.1	-22.7	.29	52.33	54	-1.67	-	-	229	336	H
4	* 2.39	42.89	RMS	32.1	-22.7	.29	52.58	54	-1.42	-	-	229	336	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	54.24	PK	32.1	-22.7	0	63.64	-	-	74	-10.36	293	281	V
2	* 2.39	54	PK	32.1	-22.7	0	63.4	-	-	74	-10.6	293	281	V
3	* 2.39	38.92	RMS	32.1	-22.7	.29	48.61	54	-5.39	-	-	293	281	V
4	* 2.39	39.71	RMS	32.1	-22.7	.29	49.4	54	-4.6	-	-	293	281	V

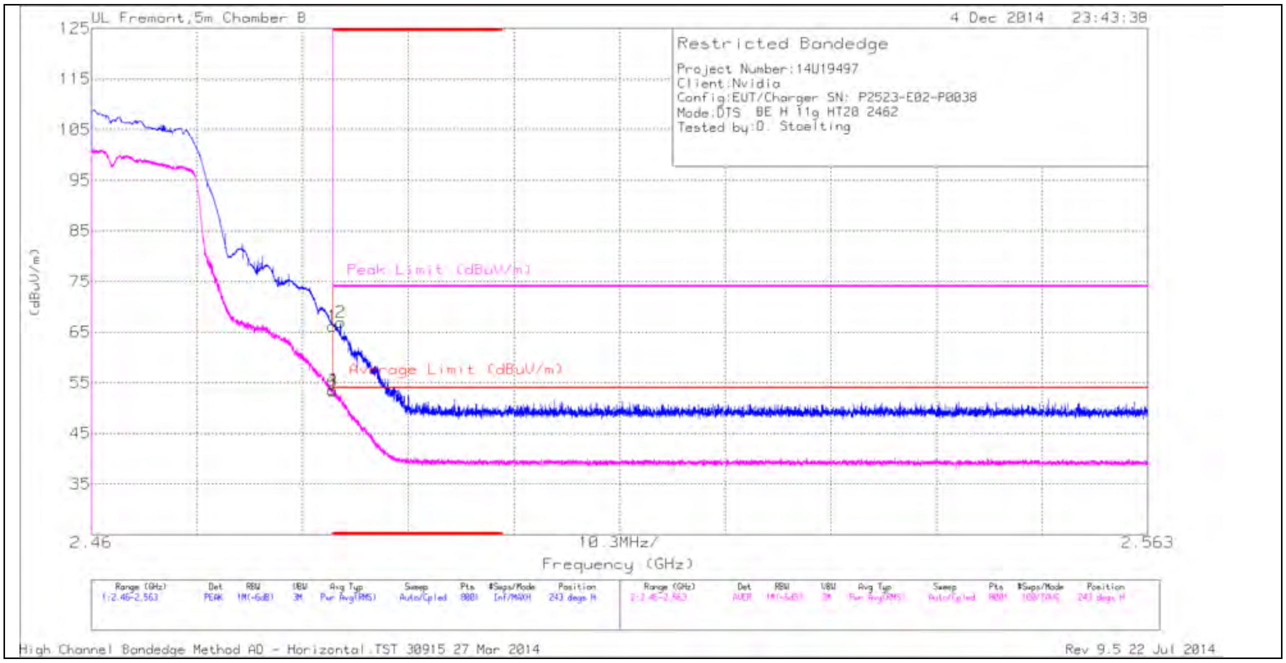
* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

RMS - RMS detection

AUTHORIZED BANDEDGE (HIGH CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

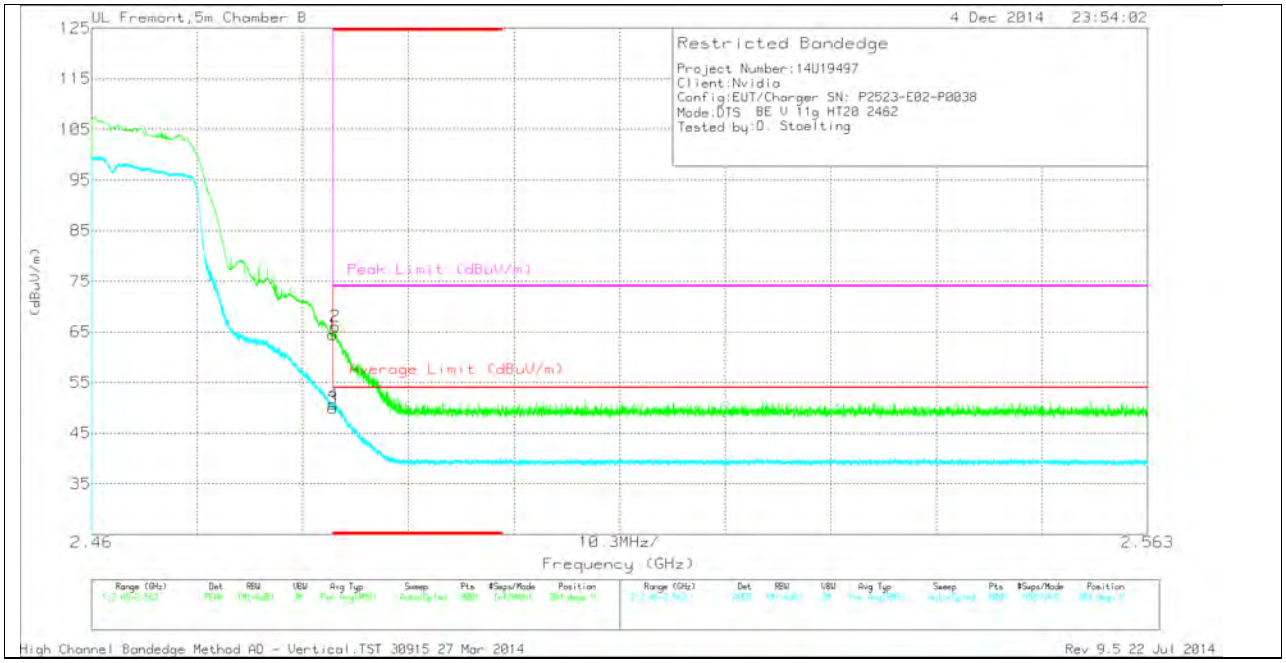
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Flt r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	56.44	PK	32.4	-22.6	0	66.24	-	-	74	-7.76	243	322	H
2	* 2.484	57.18	PK	32.4	-22.6	0	66.98	-	-	74	-7.02	243	322	H
3	* 2.484	43.29	RMS	32.4	-22.6	.29	53.38	54	-.62	-	-	243	322	H
4	* 2.484	43.53	RMS	32.4	-22.6	.29	53.62	54	-.38	-	-	243	322	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	54.63	PK	32.4	-22.6	0	64.43	-	-	74	-9.57	304	332	V
2	* 2.484	56.27	PK	32.4	-22.6	0	66.07	-	-	74	-7.93	304	332	V
3	* 2.484	39.88	RMS	32.4	-22.6	.29	49.97	54	-4.03	-	-	304	332	V
4	* 2.484	40.62	RMS	32.4	-22.6	.29	50.71	54	-3.29	-	-	304	332	V

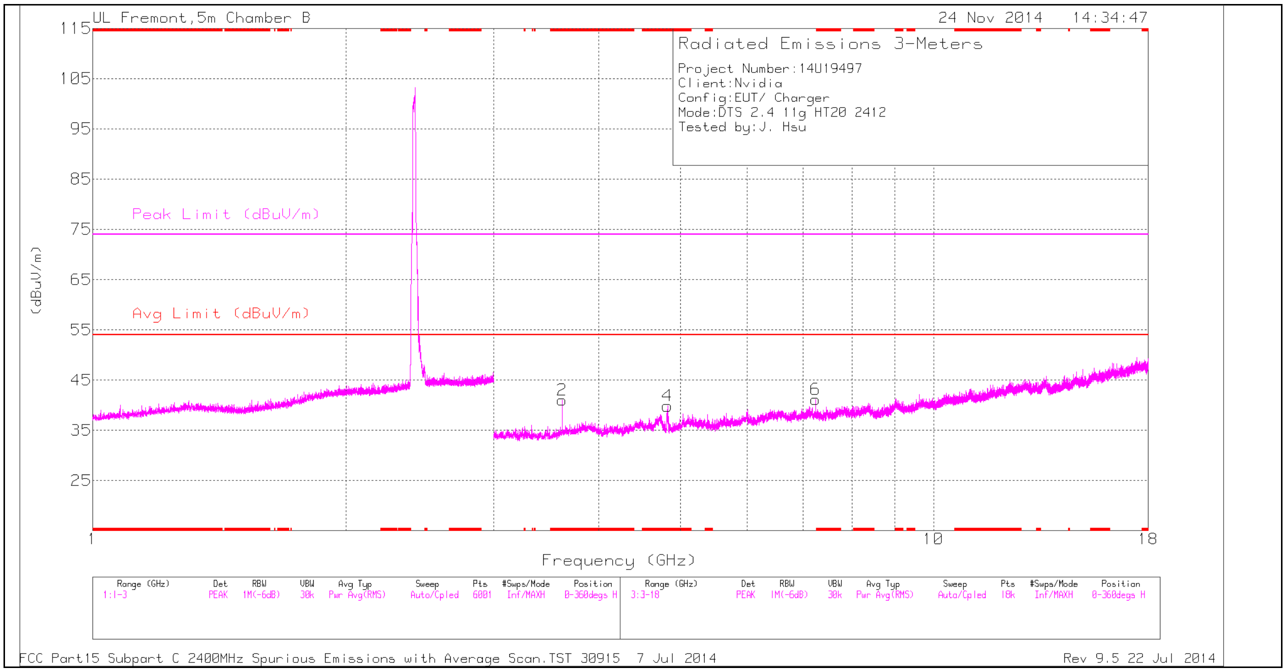
* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

RMS - RMS detection

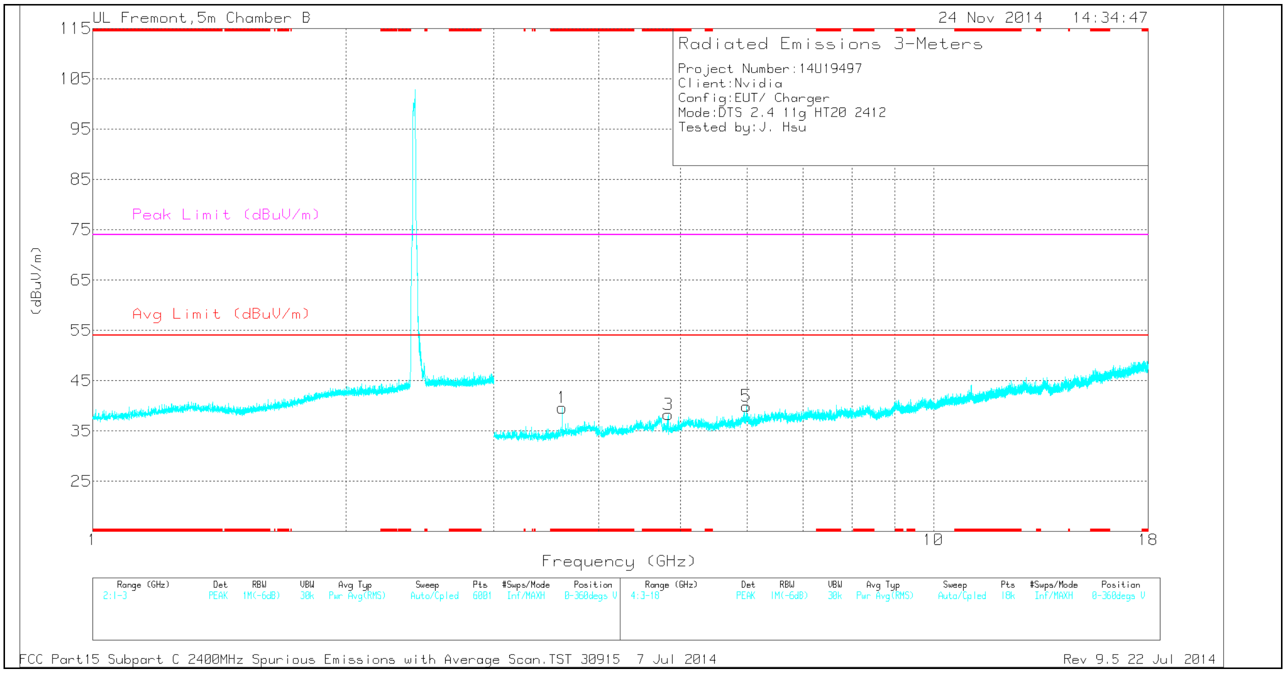
HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

LOW CHANNEL VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

LOW CHANNEL DATA

TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 3.618	38.71	PK	33.2	-30.9	0	41.01	-	-	74	-32.99	0-360	101	H
4	* 4.827	35.67	PK	34.2	-30	0	39.87	-	-	74	-34.13	0-360	101	H
1	* 3.618	37.32	PK	33.2	-30.9	0	39.62	-	-	74	-34.38	0-360	101	V
3	* 4.837	34.27	PK	34.2	-30.2	0	38.27	-	-	74	-35.73	0-360	200	V
5	5.99	33.52	PK	35.2	-28.8	0	39.92	-	-	-	-	0-360	200	V
6	7.236	33.33	PK	35.6	-27.8	0	41.13	-	-	-	-	0-360	200	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

RADIATED EMISSIONS

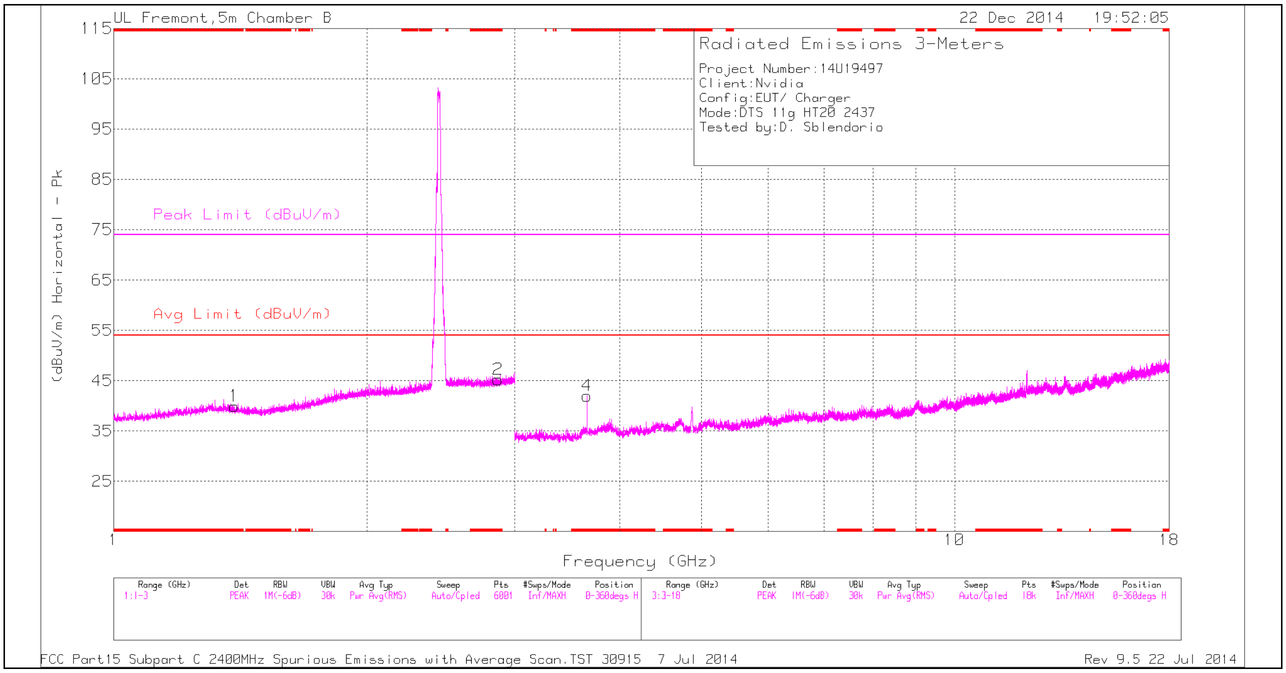
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 3.618	44.59	PK2	33.2	-30.9	0	46.89	-	-	74	-27.11	197	103	H
* 3.618	38.19	MAv1	33.2	-30.9	.3	40.79	54	-13.21	-	-	197	103	H
* 4.828	45.05	PK2	34.2	-30	0	49.25	-	-	74	-24.75	303	166	H
* 4.823	32.5	MAv1	34.2	-30	.3	37	54	-17	-	-	303	166	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

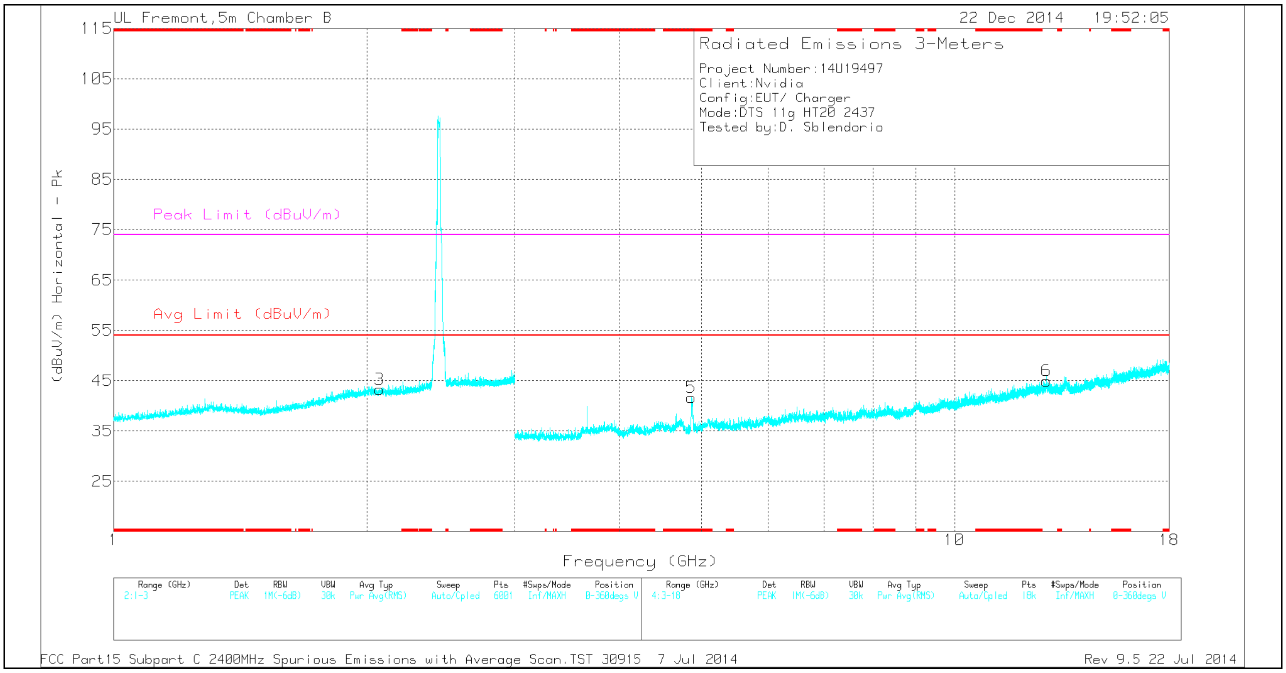
RMS - RMS detection

MID CHANNEL HORIZONTAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

MID CHANNEL VERTICAL



Radiated Emissions 3-Meters
Project Number:14U19497
Client:Nvidia
Config:EUT/ Charger
Mode:DTS 11g HT20 2437
Tested by:D. Sblendorio

Range (GHz)	Det	RBW	VBW	Avg Typ	Sweep	Pts	#Swps/Mode	Position
2:1-3	PEAK	1M(-6dB)	30k	Pwr Avg(RMS)	Auto/Cpled	6001	Inf/MAXH	0-360degs V
4:3-18	PEAK	1M(-6dB)	30k	Pwr Avg(RMS)	Auto/Cpled	18k	Inf/MAXH	0-360degs V

FCC Part15 Subpart C 2400MHz Spurious Emissions with Average Scan.TST 30915 7 Jul 2014 Rev 9.5 22 Jul 2014

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

MID CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.392	35.64	PK	28.5	-24.2	0	39.94	-	-	74	-34.06	0-360	199	H
2	* 2.866	35.04	PK	32.5	-22.3	0	45.24	-	-	74	-28.76	0-360	101	H
4	* 3.656	39.79	PK	33.2	-31	0	41.99	-	-	74	-32.01	0-360	199	H
5	* 4.868	37.95	PK	34.2	-30.5	0	41.65	-	-	74	-32.35	0-360	199	V
3	2.072	35.17	PK	31.3	-23.2	0	43.27	-	-	-	-	0-360	101	V
6	12.874	26.77	PK	39.2	-21	0	44.97	-	-	-	-	0-360	199	V

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK - Peak detector

Radiated Emissions

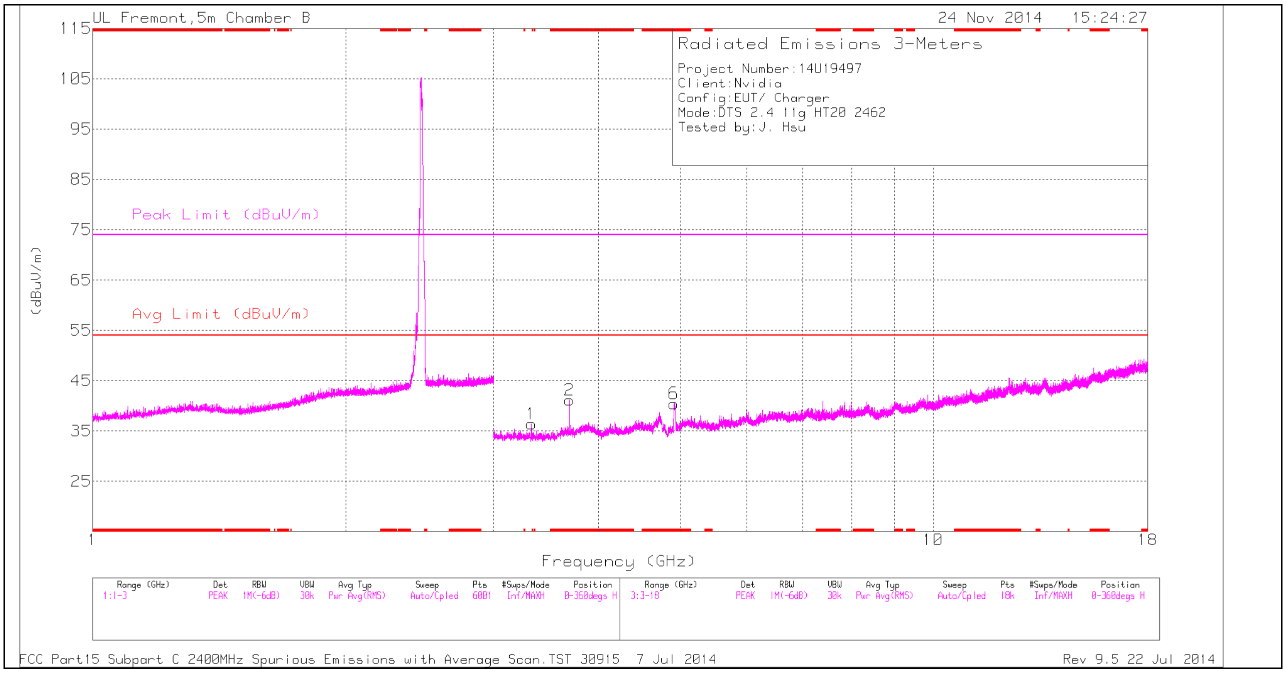
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 3.655	42.92	PK2	33.2	-31	0	45.12	-	-	74	-28.88	359	199	H
* 3.656	35.62	MAv1	33.2	-31	.3	38.12	54	-15.88	-	-	359	199	H
* 4.868	43.08	PK2	34.2	-30.5	0	46.78	-	-	74	-27.22	359	199	V
* 4.869	31.8	MAv1	34.2	-30.6	.3	35.7	54	-18.3	-	-	359	199	V

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

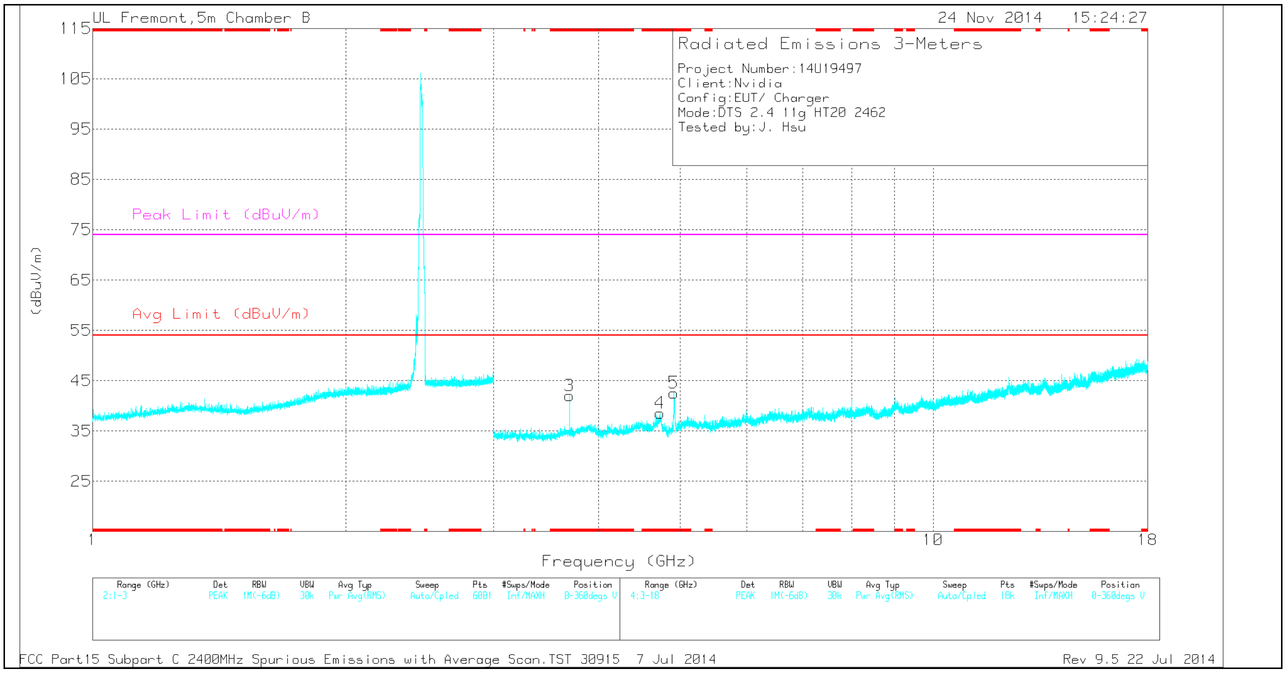
RMS - RMS detection

HIGH CHANNEL HORIZONTAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

HIGH CHANNEL VERTICAL



Radiated Emissions 3-Meters

Project Number:14U19497
Client:Nvidia
Config:EUT/ Charger
Mode:DTS 2.4 11g HT20 2462
Tested by:J. Hsu

Range (GHz)	Det	RBW	VBW	Avg Typ	Sweep	Pts	#Swps/Mode	Position
2:1-3	PEAK	1M(-6dB)	30k	Pwr Avg(RMS)	Auto/Cpled	6001	Inf/MAXH	0-360degs V
4:3-18	PEAK	1M(-6dB)	30k	Pwr Avg(RMS)	Auto/Cpled	18k	Inf/MAXH	0-360degs V

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

HIGH CHANNEL DATA

TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 3.693	39.22	PK	33.3	-31.4	0	41.12	-	-	74	-32.88	0-360	199	H
6	* 4.917	37.04	PK	34.2	-30.8	0	40.44	-	-	74	-33.56	0-360	199	H
3	* 3.693	40.11	PK	33.3	-31.4	0	42.01	-	-	74	-31.99	0-360	101	V
4	* 4.736	33.57	PK	34.2	-29.2	0	38.57	-	-	74	-35.43	0-360	101	V
5	* 4.912	39.16	PK	34.2	-30.8	0	42.56	-	-	74	-31.44	0-360	101	V
1	3.328	34.91	PK	32.8	-31.3	0	36.41	-	-	-	-	0-360	101	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

RADIATED EMISSIONS

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 3.693	45.72	PK2	33.3	-31.4	0	47.62	-	-	74	-26.38	39	101	V
* 3.693	39.78	MAv1	33.3	-31.4	.3	41.98	54	-12.02	-	-	39	101	V
* 4.913	48.39	PK2	34.2	-30.8	0	51.79	-	-	74	-22.21	210	146	V
* 4.913	35.07	MAv1	34.2	-30.8	.3	38.77	54	-15.23	-	-	210	146	V

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

RMS - RMS detection

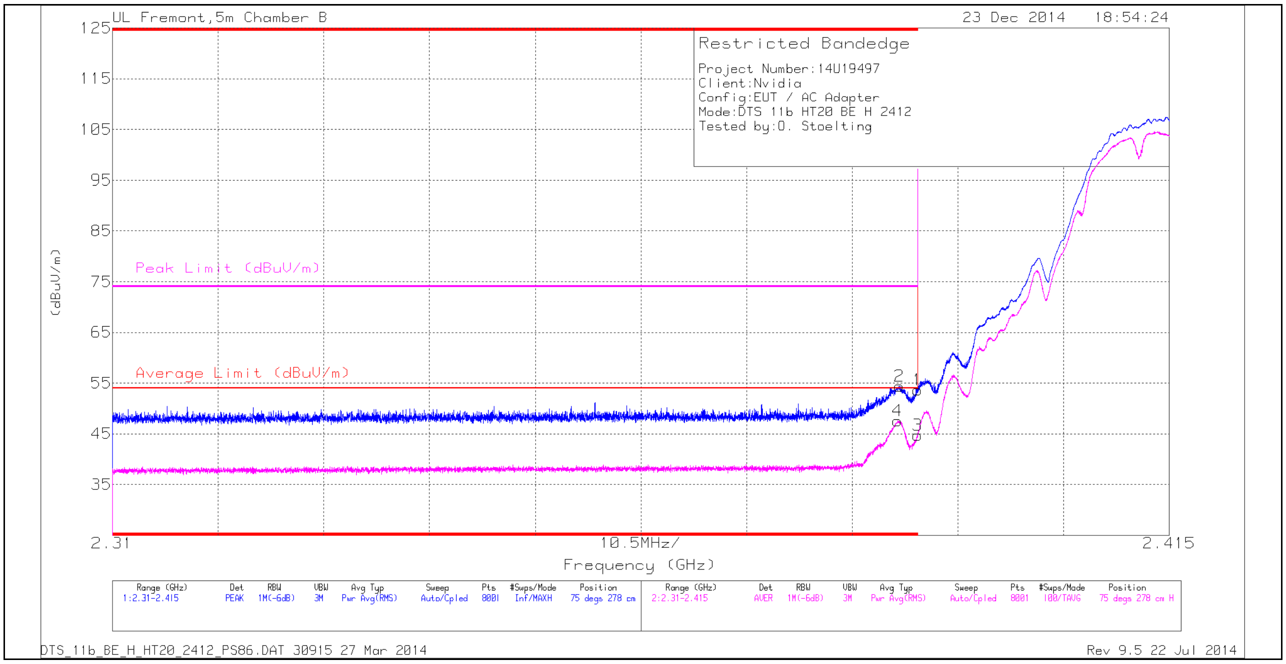
13. RADIATED TEST RESULTS SISO 802.11b/g Chain 1

13.1. TRANSMITTER ABOVE 1 GHz

13.1.1. TX ABOVE 1 GHz 802.11b MODE IN THE 2.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



Project Number:14U19497
Client:Nvidia
Config:EUT / AC Adapter
Mode:DTS 11b HT20 BE H 2412
Tested by:O. Stoelting

Range (GHz)	Det	RBW	VBW	Avg Typ	Sweep	Pts	#Swps/Mode	Position
1:2.31-2.415	PEAK	1M(-6dB)	3M	Pwr Avg(RMS)	Auto/Cpled	8001	Inf/MAXH	75 degs 278 cm
2:2.31-2.415	AVER	1M(-6dB)	3M	Pwr Avg(RMS)	Auto/Cpled	8001	100/TAVG	75 degs 278 cm H

HORIZONTAL DATA

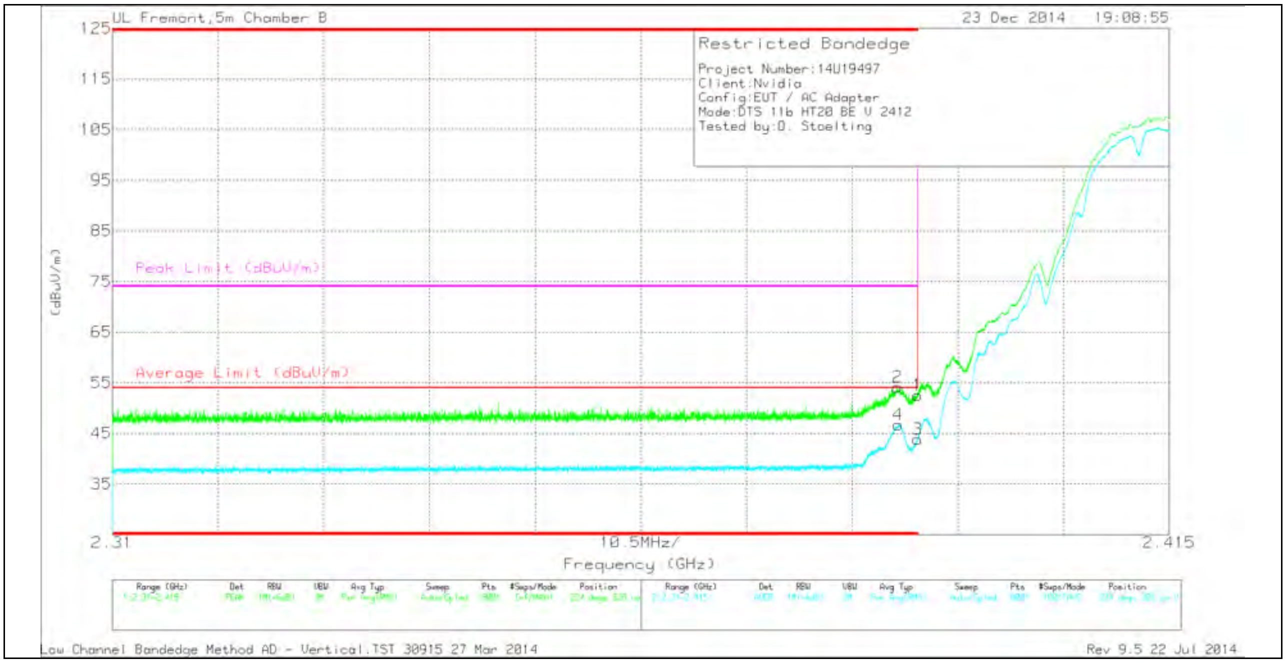
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 2.388	44.96	PK	32.1	-22.7	54.36	-	-	74	-19.64	75	278	H
4	* 2.388	38.17	RMS	32.1	-22.7	47.57	54	-6.43	-	-	75	278	H
1	* 2.39	44.26	PK	32.1	-22.7	53.66	-	-	74	-20.34	75	278	H
3	* 2.39	35.28	RMS	32.1	-22.7	44.68	54	-9.32	-	-	75	278	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 2.388	44.77	PK	32.1	-22.7	54.17	-	-	74	-19.83	224	328	V
4	* 2.388	37.33	RMS	32.1	-22.7	46.73	54	-7.27	-	-	224	328	V
1	* 2.39	43.08	PK	32.1	-22.7	52.48	-	-	74	-21.52	224	328	V
3	* 2.39	34.43	RMS	32.1	-22.7	43.83	54	-10.17	-	-	224	328	V

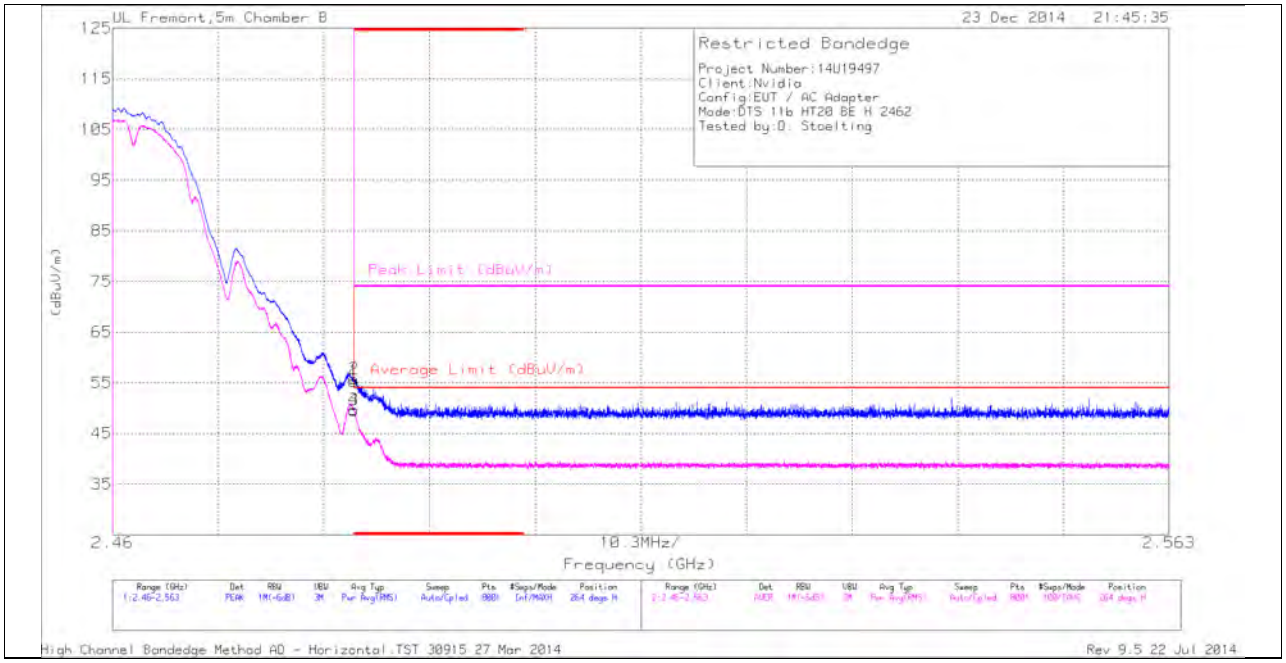
* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK - Peak detector

RMS - RMS detection

AUTHORIZED BANDEDGE (HIGH CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

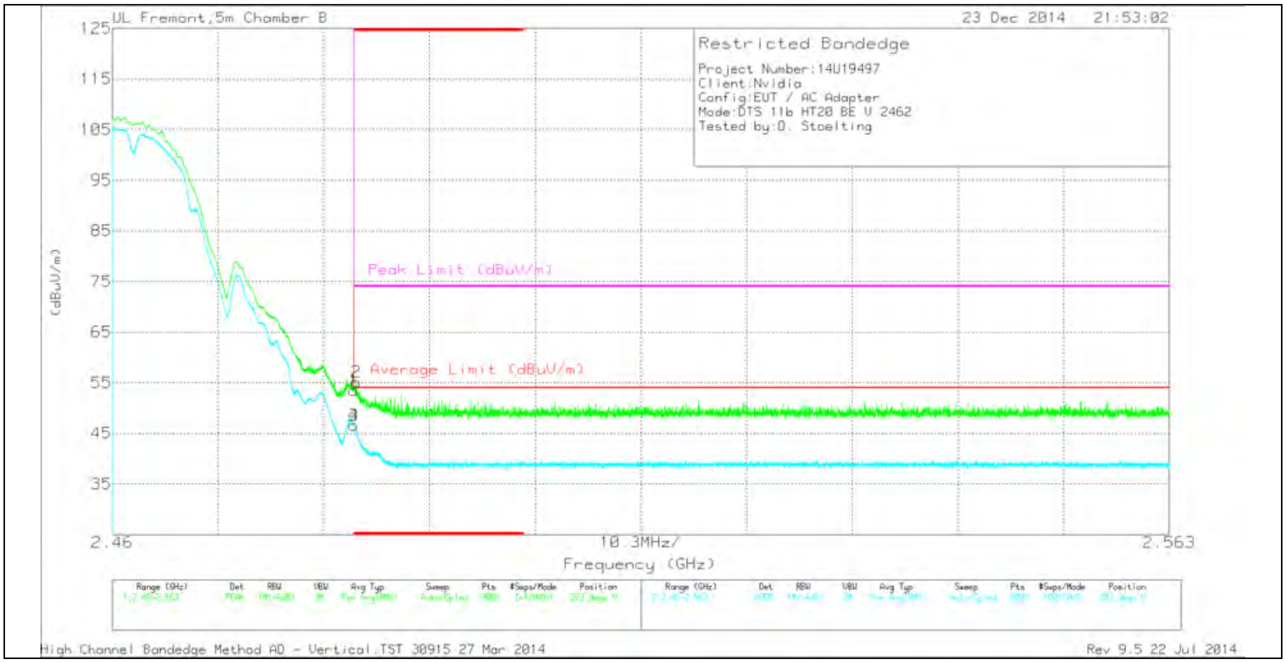
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	45.52	PK	32.4	-22.6	55.32	-	-	74	-18.68	264	266	H
2	* 2.484	45.95	PK	32.4	-22.6	55.75	-	-	74	-18.25	264	266	H
3	* 2.484	39.86	RMS	32.4	-22.6	49.66	54	-4.34	-	-	264	266	H
4	* 2.484	39.81	RMS	32.4	-22.6	49.61	54	-4.39	-	-	264	266	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	43.77	PK	32.4	-22.6	53.57	-	-	74	-20.43	223	321	V
2	* 2.484	45.37	PK	32.4	-22.6	55.17	-	-	74	-18.83	223	321	V
3	* 2.484	36.76	RMS	32.4	-22.6	46.56	54	-7.44	-	-	223	321	V
4	* 2.484	36.73	RMS	32.4	-22.6	46.53	54	-7.47	-	-	223	321	V

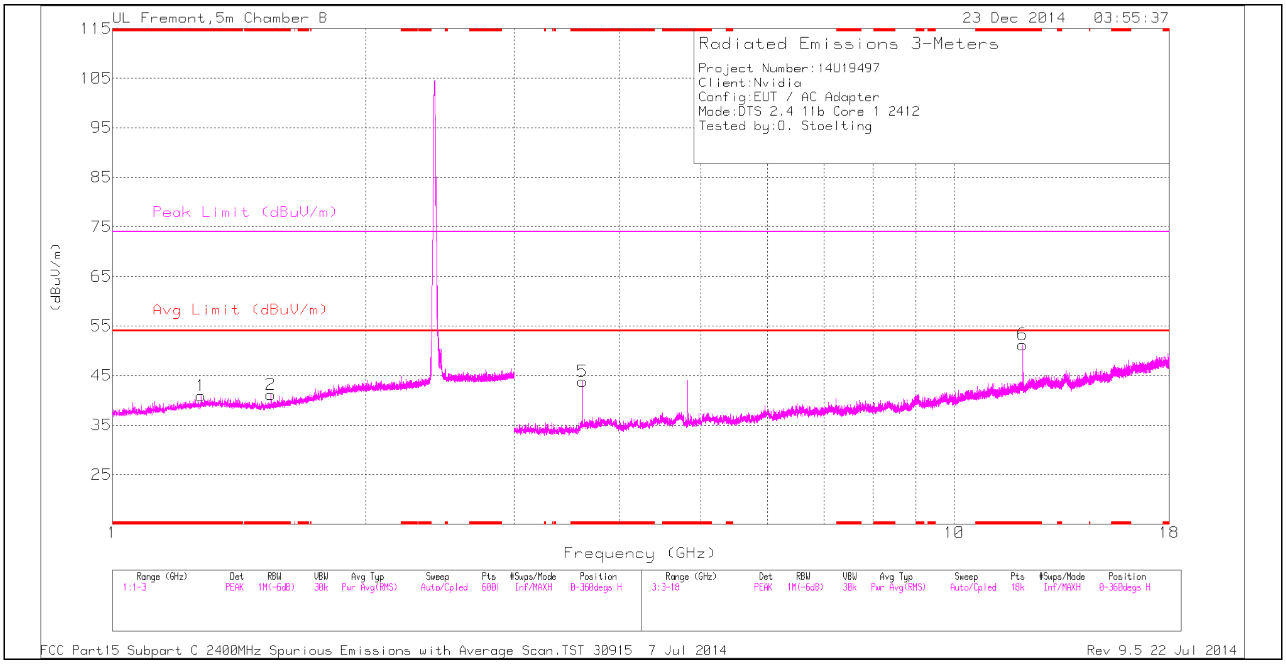
* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK - Peak detector

RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



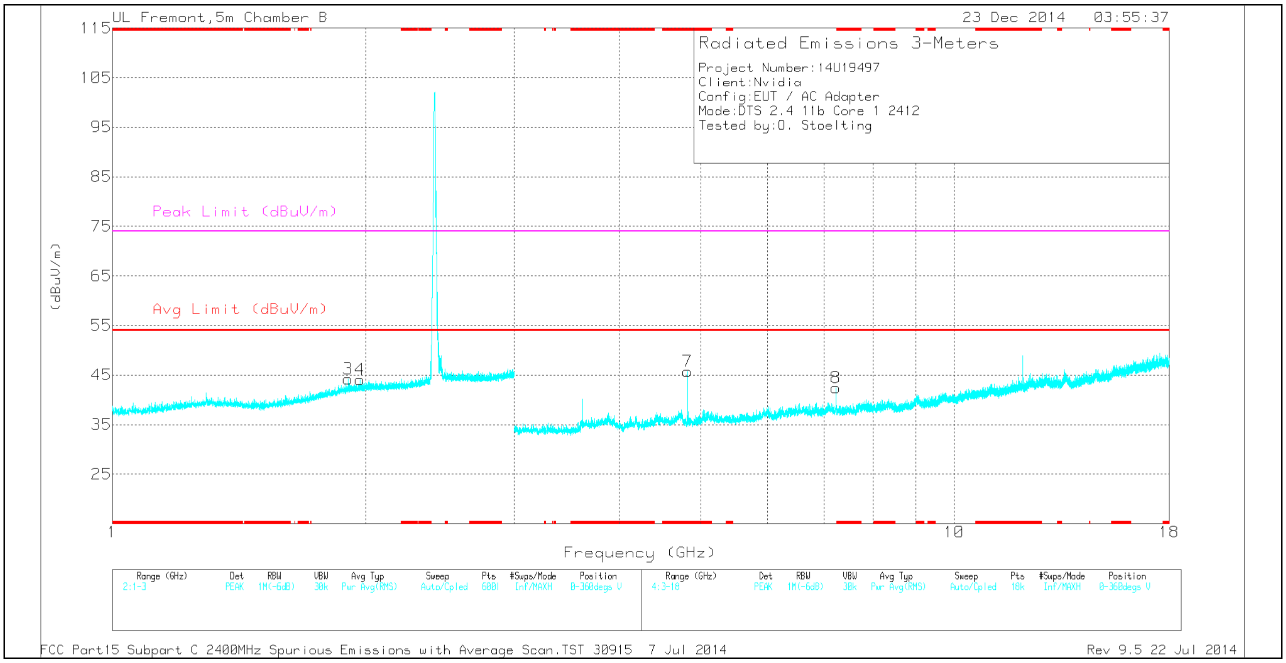
Radiated Emissions 3-Meters
Project Number:14U19497
Client:Nvidia
Config:EUT / AC Adapter
Mode:DTS 2.4 11b Core 1 2412
Tested by:O. Stoelting

Range (GHz)	Det	RBW	VBW	Avg Typ	Sweep	Pts	#Swps/Mode	Position
1:1-3	PEAK	1M(-6dB)	30k	Pwr Avg(RMS)	Auto/Cpled	6001	Inf/MAXH	0-360degs H
3:3-18	PEAK	1M(-6dB)	30k	Pwr Avg(RMS)	Auto/Cpled	18k	Inf/MAXH	0-360degs H

FCC Part15 Subpart C 2400MHz Spurious Emissions with Average Scan.TST 30915 7 Jul 2014 Rev 9.5 22 Jul 2014

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

LOW CHANNEL VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

LOW CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.273	36.55	PK	28.7	-24.4	40.85	-	-	74	-33.15	0-360	199	H
2	* 1.543	36.81	PK	28.2	-23.9	41.11	-	-	74	-32.89	0-360	101	H
5	* 3.618	41.5	PK	33.2	-30.9	43.8	-	-	74	-30.2	0-360	199	H
6	* 12.061	35.05	PK	38.8	-22.6	51.25	-	-	74	-22.75	0-360	199	H
7	* 4.824	41.5	PK	34.2	-30	45.7	-	-	74	-28.3	0-360	199	V
3	1.906	36.56	PK	31.1	-23.4	44.26	-	-	-	-	0-360	199	V
4	1.969	36.16	PK	31.3	-23.4	44.06	-	-	-	-	0-360	101	V
8	7.234	34.58	PK	35.6	-27.8	42.38	-	-	-	-	0-360	199	V

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK - Peak detector

Radiated Emissions

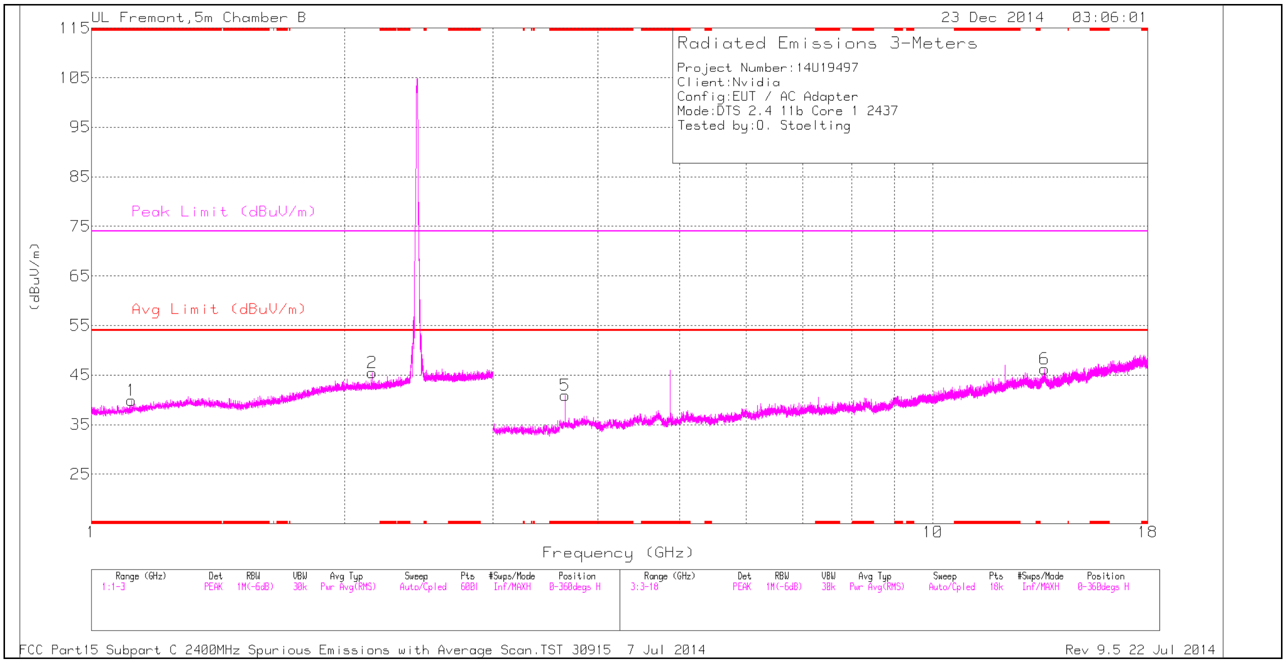
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 3.618	45.61	PK2	33.2	-30.9	47.91	-	-	74	-26.09	257	200	H
* 3.618	39.94	MAv1	33.2	-30.9	42.24	54	-11.76	-	-	257	200	H
* 12.061	41.01	PK2	38.8	-22.6	57.21	-	-	74	-16.79	16	243	H
* 12.061	34.58	MAv1	38.8	-22.6	50.78	54	-3.22	-	-	16	243	H
* 4.824	45.69	PK2	34.2	-30	49.89	-	-	74	-24.11	230	230	V
* 4.824	41.82	MAv1	34.2	-30	46.02	54	-7.98	-	-	230	230	V
7.235	42.48	PK2	35.6	-27.8	50.28	-	-	-	-	111	198	V
7.235	33.7	MAv1	35.6	-27.8	41.5	-	-	-	-	111	198	V

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

RMS - RMS detection

MID CHANNEL HORIZONTAL



Radiated Emissions 3-Meters

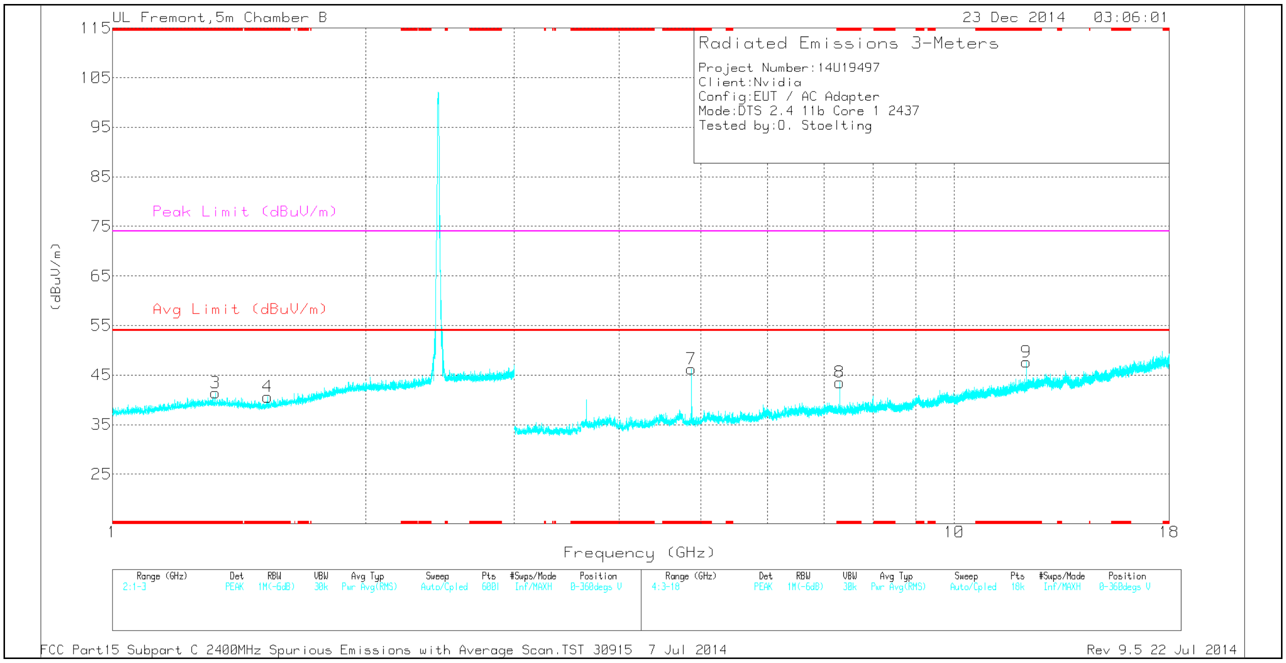
Project Number:14U19497
Client:Nvidia
Config:EUT / AC Adapter
Mode:DTS 2.4 11b Core 1 2437
Tested by:O. Stoelting

Range (GHz)	Det	RBW	VBW	Avg Typ	Sweep	Pts	#Swps/Mode	Position
1:1-3	PEAK	1M(-6dB)	30k	Pwr Avg(RMS)	Auto/Cpled	6001	Inf/MAXH	0-360degs H
3:3-18	PEAK	1M(-6dB)	30k	Pwr Avg(RMS)	Auto/Cpled	18k	Inf/MAXH	0-360degs H

FCC Part15 Subpart C 2400MHz Spurious Emissions with Average Scan.TST 30915 7 Jul 2014 Rev 9.5 22 Jul 2014

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

MID CHANNEL VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

MID CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.116	36.84	PK	27.5	-24.5	39.84	-	-	74	-34.16	0-360	101	H
3	* 1.325	36.94	PK	28.8	-24.3	41.44	-	-	74	-32.56	0-360	101	V
4	* 1.528	36.39	PK	28.1	-23.9	40.59	-	-	74	-33.41	0-360	101	V
5	* 3.656	38.75	PK	33.2	-31	40.95	-	-	74	-33.05	0-360	199	H
7	* 4.874	42.68	PK	34.2	-30.6	46.28	-	-	74	-27.72	0-360	199	V
8	* 7.31	36.31	PK	35.6	-28.4	43.51	-	-	74	-30.49	0-360	199	V
9	* 12.184	31.23	PK	38.9	-22.5	47.63	-	-	74	-26.37	0-360	199	V
2	2.155	37.25	PK	31.3	-23.1	45.45	-	-	-	-	0-360	101	H
6	13.583	27.8	PK	38.8	-20.4	46.2	-	-	-	-	0-360	101	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK - Peak detector

Radiated Emissions

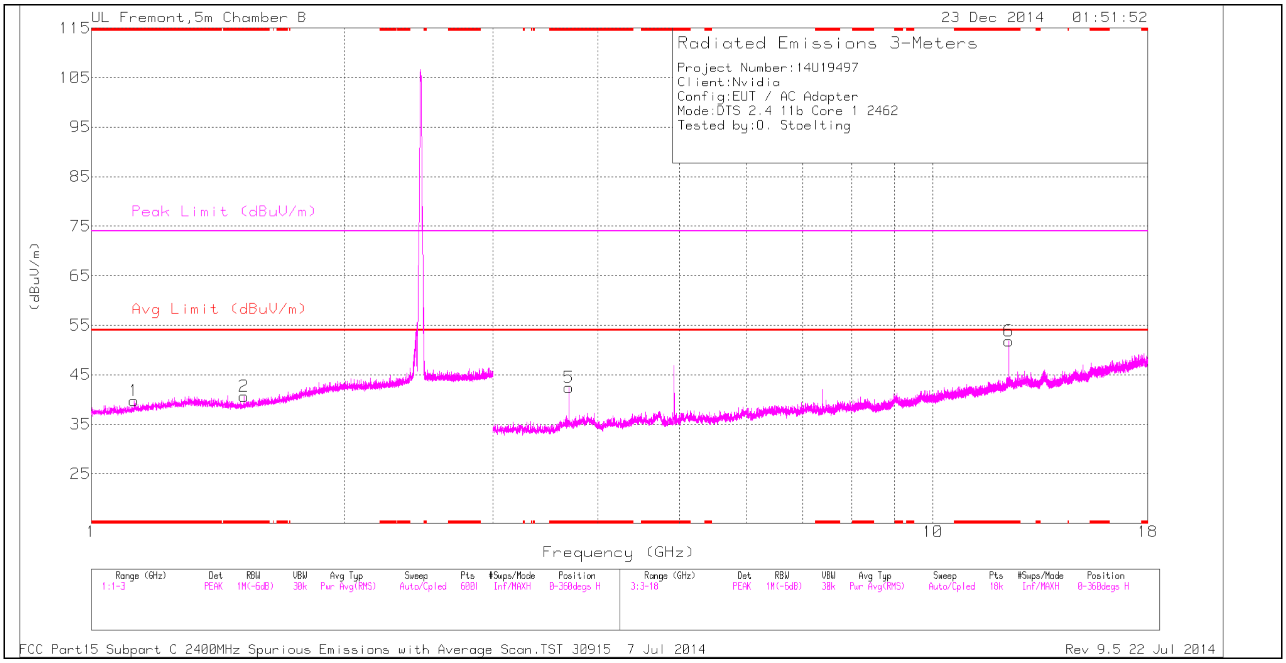
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 3.655	43.75	PK2	33.2	-31	45.95	-	-	74	-28.05	254	267	H
* 3.656	35.97	MAv1	33.2	-31	38.17	54	-15.83	-	-	254	267	H
* 4.874	46.95	PK2	34.2	-30.6	50.55	-	-	74	-23.45	225	252	V
* 4.874	42.18	MAv1	34.2	-30.6	45.78	54	-8.22	-	-	225	252	V
* 7.311	42.96	PK2	35.6	-28.4	50.16	-	-	74	-23.84	211	247	V
* 7.31	34.74	MAv1	35.6	-28.4	41.94	54	-12.06	-	-	211	247	V
* 12.185	38.58	PK2	38.9	-22.5	54.98	-	-	74	-19.02	234	336	V
* 12.184	30.08	MAv1	38.9	-22.5	46.48	54	-7.52	-	-	234	336	V

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

RMS - RMS detection

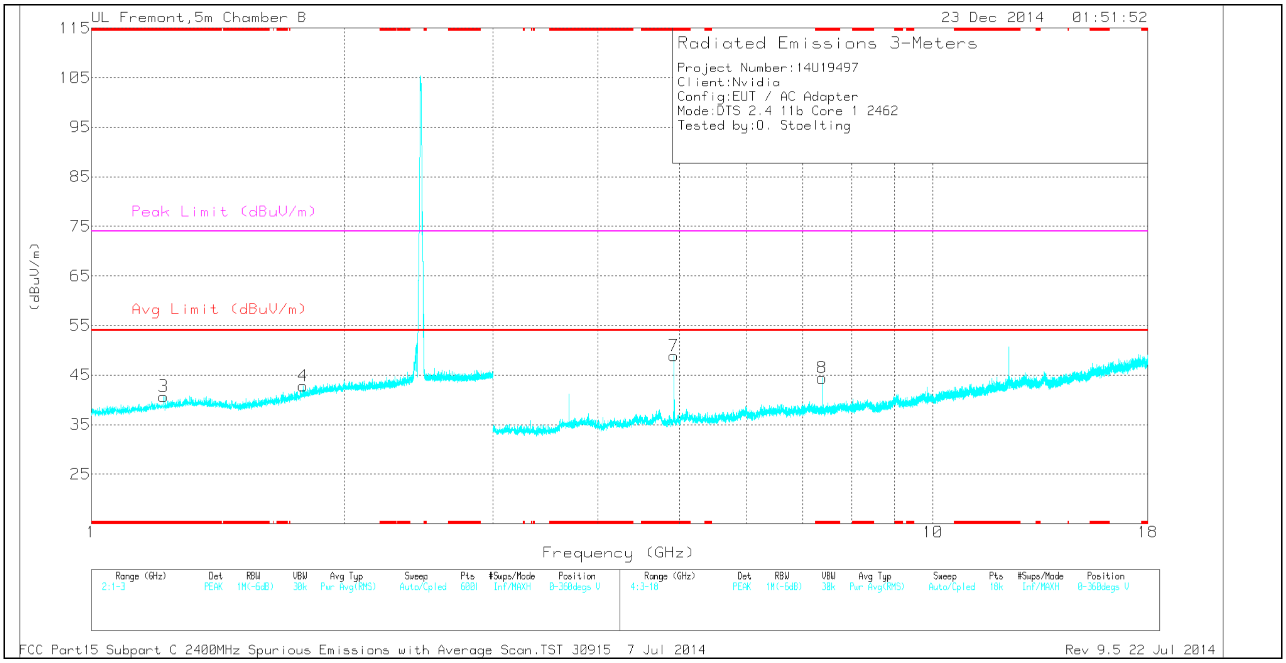
HIGH CHANNEL HORIZONTAL



Range (GHz)	Det	RBW	VBW	Avg Typ	Sweep	Pts	#Swps/Mode	Position
1:1-3	PEAK	1M(-6dB)	30k	Pwr Avg(RMS)	Auto/Cpled	6001	Inf/MAXH	0-360degs H
3:3-18	PEAK	1M(-6dB)	30k	Pwr Avg(RMS)	Auto/Cpled	18k	Inf/MAXH	0-360degs H

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

HIGH CHANNEL VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

HIGH CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.125	36.61	PK	27.6	-24.5	39.71	-	-	74	-34.29	0-360	200	H
2	* 1.518	36.54	PK	28	-23.9	40.64	-	-	74	-33.36	0-360	101	H
3	* 1.218	36.81	PK	28.3	-24.4	40.71	-	-	74	-33.29	0-360	101	V
5	* 3.693	40.47	PK	33.3	-31.4	42.37	-	-	74	-31.63	0-360	199	H
6	* 12.311	34.84	PK	39	-22	51.84	-	-	74	-22.16	0-360	199	H
7	* 4.924	45.56	PK	34.2	-30.9	48.86	-	-	74	-25.14	0-360	199	V
8	* 7.385	36.6	PK	35.6	-27.8	44.4	-	-	74	-29.6	0-360	199	V
4	1.785	36.26	PK	30	-23.5	42.76	-	-	-	-	0-360	101	V

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 3.693	45.09	PK2	33.3	-31.4	46.99	-	-	74	-27.01	84	230	H
* 3.693	38.94	MAv1	33.3	-31.4	40.84	54	-13.16	-	-	84	230	H
* 12.31	41.29	PK2	39	-22	58.29	-	-	74	-15.71	222	235	H
* 12.309	35.07	MAv1	39	-22	52.07	54	-1.93	-	-	222	235	H
* 4.924	51.21	PK2	34.2	-30.9	54.51	-	-	74	-19.49	156	231	V
* 4.924	44.94	MAv1	34.2	-30.9	48.24	54	-5.76	-	-	156	231	V
* 7.386	43.75	PK2	35.6	-27.8	51.55	-	-	74	-22.45	37	200	V
* 7.385	36.66	MAv1	35.6	-27.8	44.46	54	-9.54	-	-	37	200	V

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

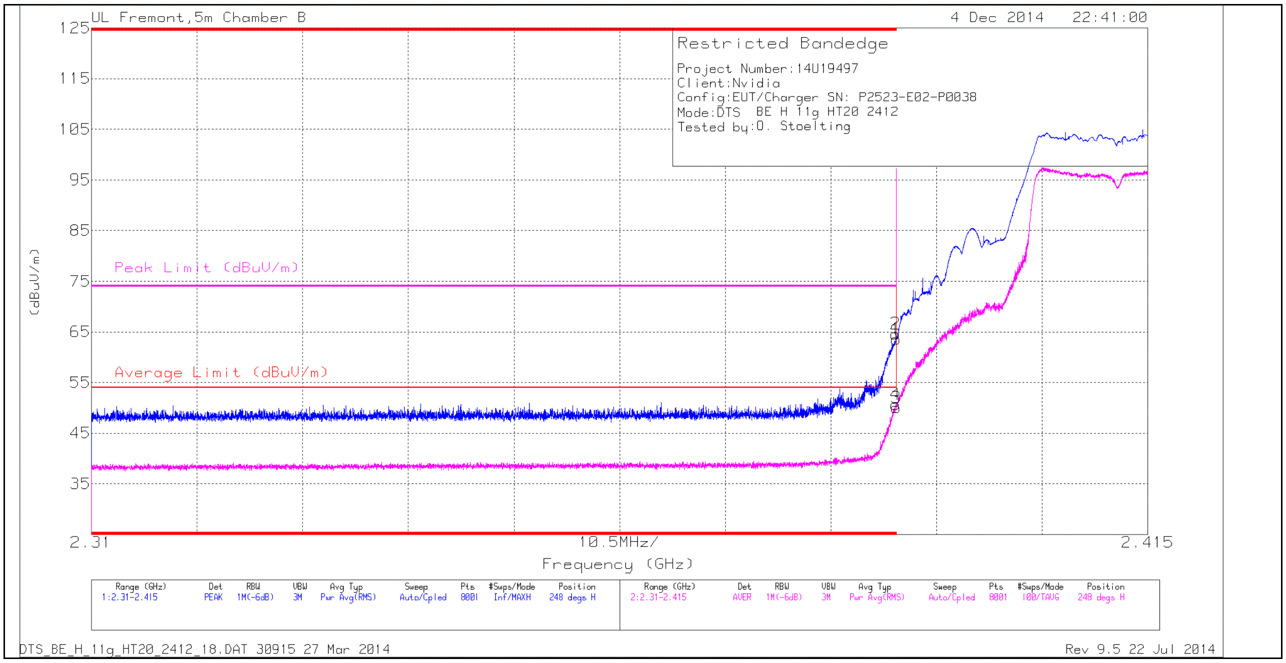
Pk - Peak detector

RMS - RMS detection

13.1.2. TX ABOVE 1 GHz 802.11g MODE IN THE 2.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

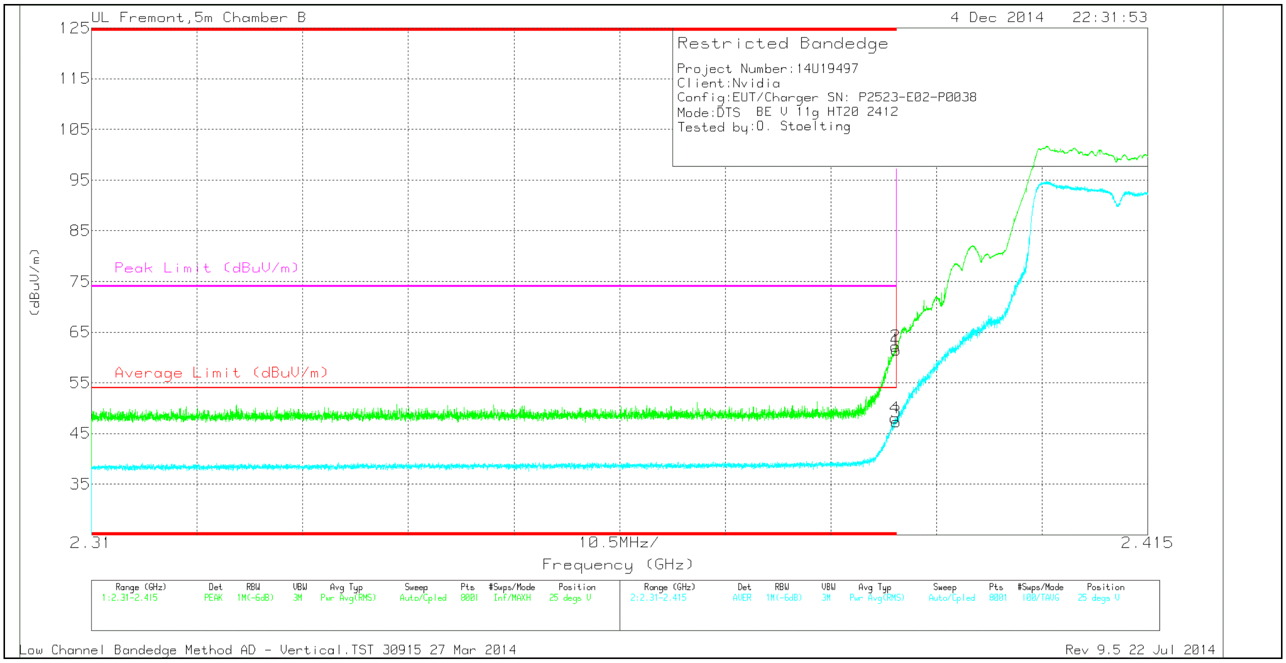
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	54.23	PK	32.1	-22.7	0	63.63	-	-	74	-10.37	248	271	H
2	* 2.39	55.23	PK	32.1	-22.7	0	64.63	-	-	74	-9.37	248	271	H
3	* 2.39	40.3	RMS	32.1	-22.7	.29	49.99	54	-4.01	-	-	248	271	H
4	* 2.39	40.94	RMS	32.1	-22.7	.29	50.63	54	-3.37	-	-	248	271	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



Restricted Bandedge
Project Number:14U19497
Client:Nvidia
Config:EUT/Charger SN: P2523-E02-P0038
Mode:DTS BE V 11g HT20 2412
Tested by:O. Stoelting

Range (GHz)	Det	RBW	VBW	Avg Typ	Sweep	Pts	#Swps/Mode	Position
1:2.31-2.415	PEAK	1M(-6dB)	3M	Pwr Avg(RMS)	Auto/Cpled	8001	Inf/MAXH	25 degs V
2:2.31-2.415	AVER	1M(-6dB)	3M	Pwr Avg(RMS)	Auto/Cpled	8001	100/TAVG	25 degs V

Low Channel Bandedge Method AD - Vertical.TST 30915 27 Mar 2014 Rev 9.5 22 Jul 2014

VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	52.08	PK	32.1	-22.7	0	61.48	-	-	74	-12.52	25	274	V
2	* 2.39	52.86	PK	32.1	-22.7	0	62.26	-	-	74	-11.74	25	274	V
3	* 2.39	37.63	RMS	32.1	-22.7	.29	47.32	54	-6.68	-	-	25	274	V
4	* 2.39	38.41	RMS	32.1	-22.7	.29	48.1	54	-5.9	-	-	25	274	V

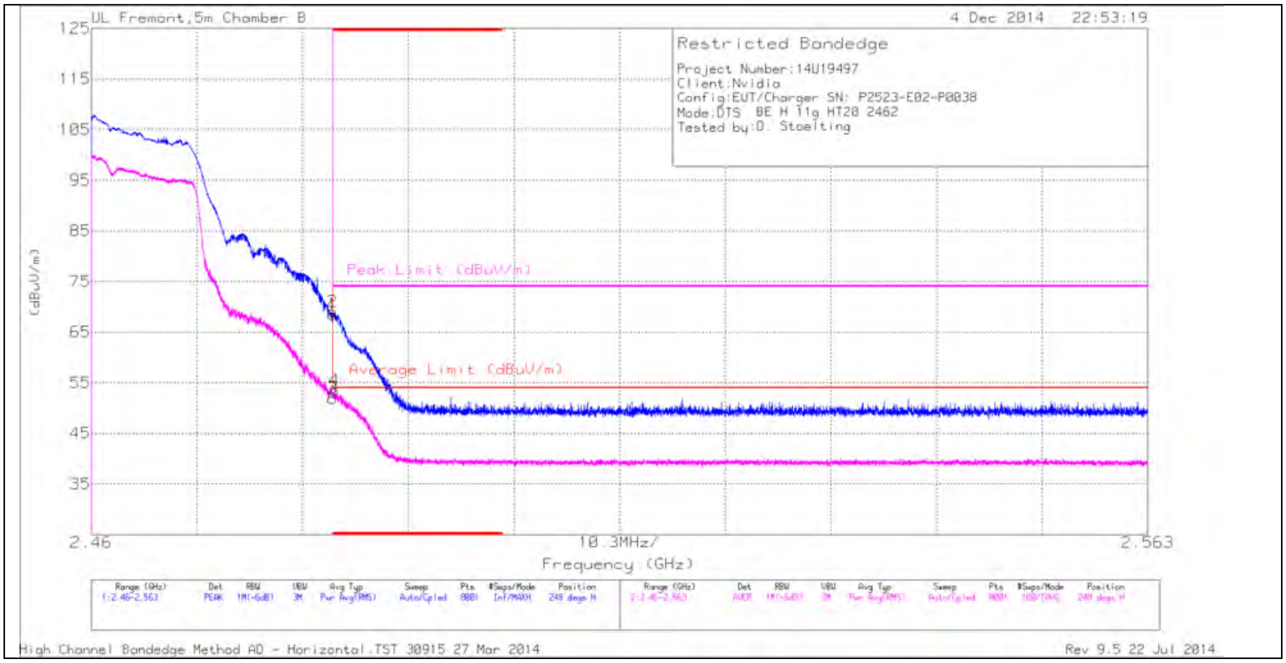
* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK - Peak detector

RMS - RMS detection

AUTHORIZED BANDEDGE (HIGH CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

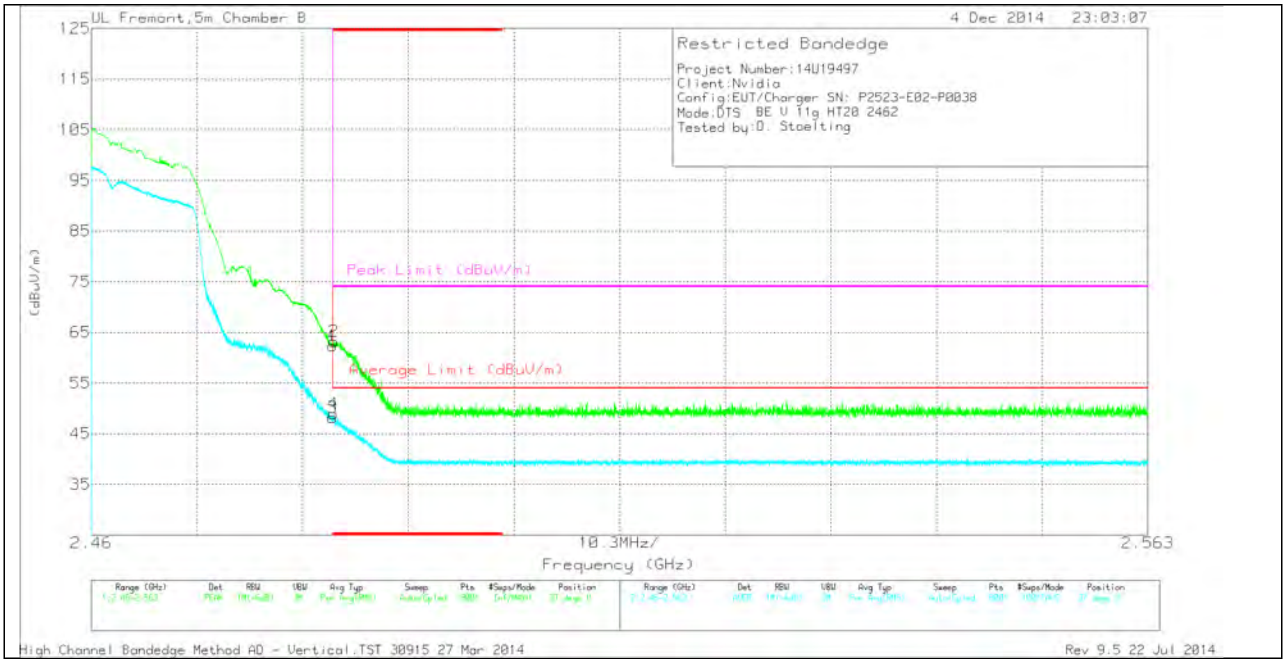
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	58.72	PK	32.4	-22.6	0	68.52	-	-	74	-5.48	248	265	H
2	* 2.484	59.22	PK	32.4	-22.6	0	69.02	-	-	74	-4.98	248	265	H
3	* 2.484	41.76	RMS	32.4	-22.6	.29	51.85	54	-2.15	-	-	248	265	H
4	* 2.484	43.46	RMS	32.4	-22.6	.29	53.55	54	-.45	-	-	248	265	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	52.54	PK	32.4	-22.6	0	62.34	-	-	74	-11.66	37	325	V
2	* 2.484	53.37	PK	32.4	-22.6	0	63.17	-	-	74	-10.83	37	325	V
3	* 2.484	38.1	RMS	32.4	-22.6	.29	48.19	54	-5.81	-	-	37	325	V
4	* 2.484	38.78	RMS	32.4	-22.6	.29	48.87	54	-5.13	-	-	37	325	V

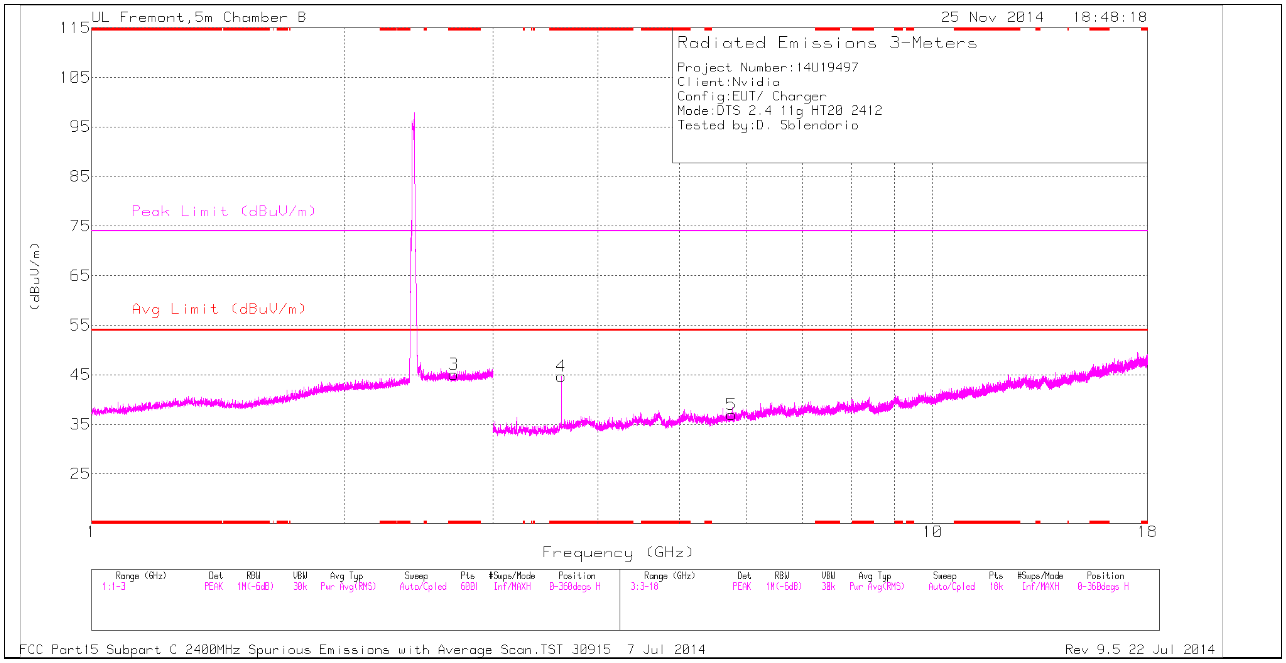
* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK - Peak detector

RMS - RMS detection

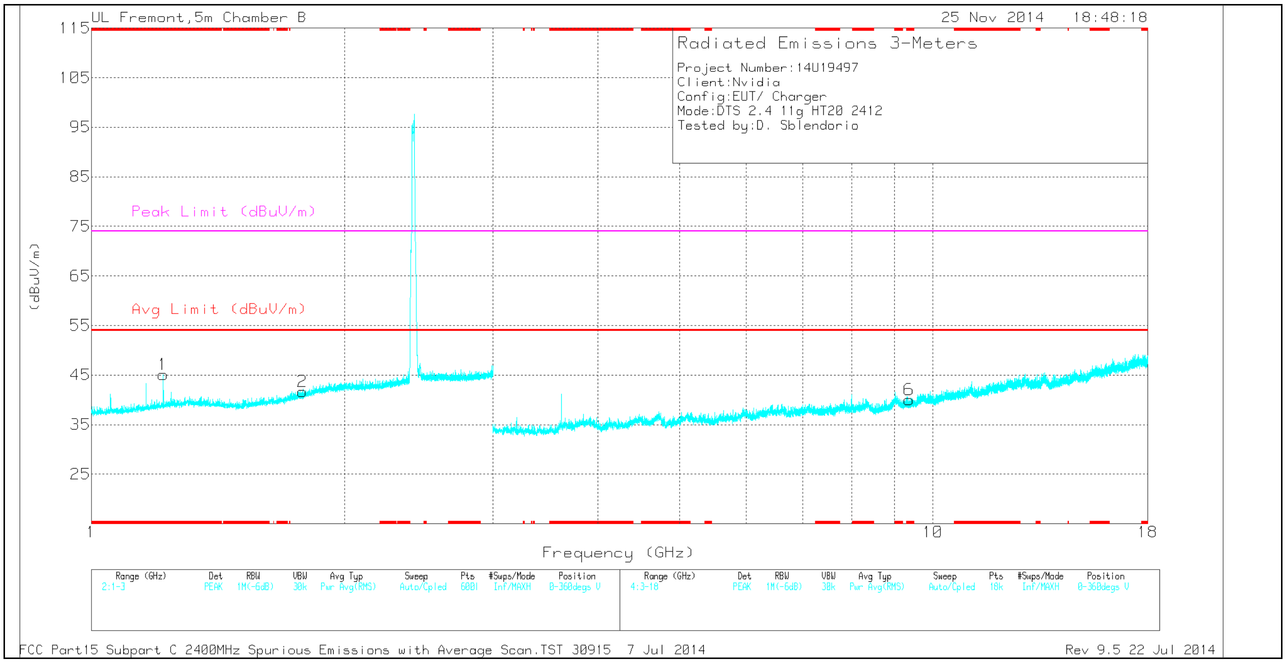
HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

LOW CHANNEL VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

LOW CHANNEL DATA

TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
3	* 2.696	35.25	PK	32.2	-22.4	0	45.05	-	-	74	-28.95	0-360	200	H
1	* 1.217	41.21	PK	28.3	-24.4	0	45.11	-	-	74	-28.89	0-360	101	V
4	* 3.618	42.41	PK	33.2	-30.9	0	44.71	-	-	74	-29.29	0-360	199	H
6	* 9.37	28.46	PK	36.5	-25	0	39.96	-	-	74	-34.04	0-360	199	V
2	1.783	35.18	PK	30	-23.5	0	41.68	-	-	-	-	0-360	200	V
5	5.761	32.26	PK	34.6	-29.9	0	36.96	-	-	-	-	0-360	101	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK - Peak detector

RADIATED EMISSIONS

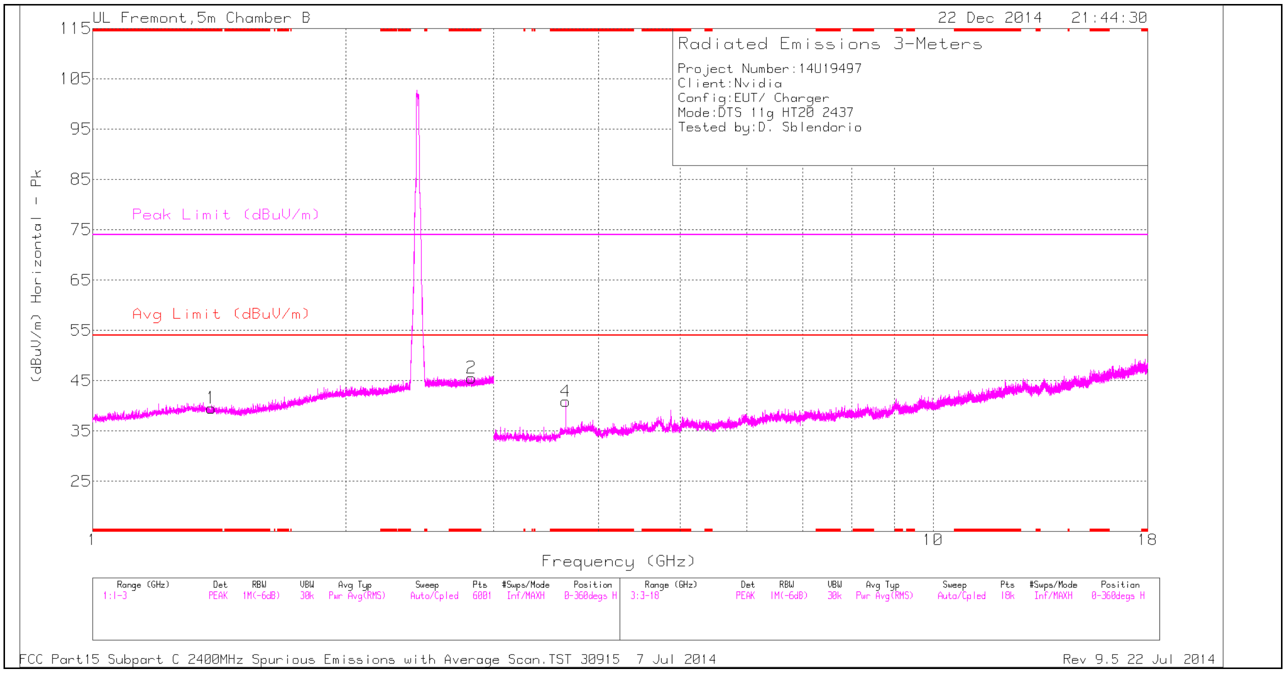
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 3.618	41.33	PK2	33.2	-30.9	0	43.63	-	-	74	-30.37	1	198	H
* 3.618	30.84	MAv1	33.2	-30.9	.29	33.43	54	-20.57	-	-	1	198	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK - Peak detector

RMS - RMS detection

MID CHANNEL HORIZONTAL



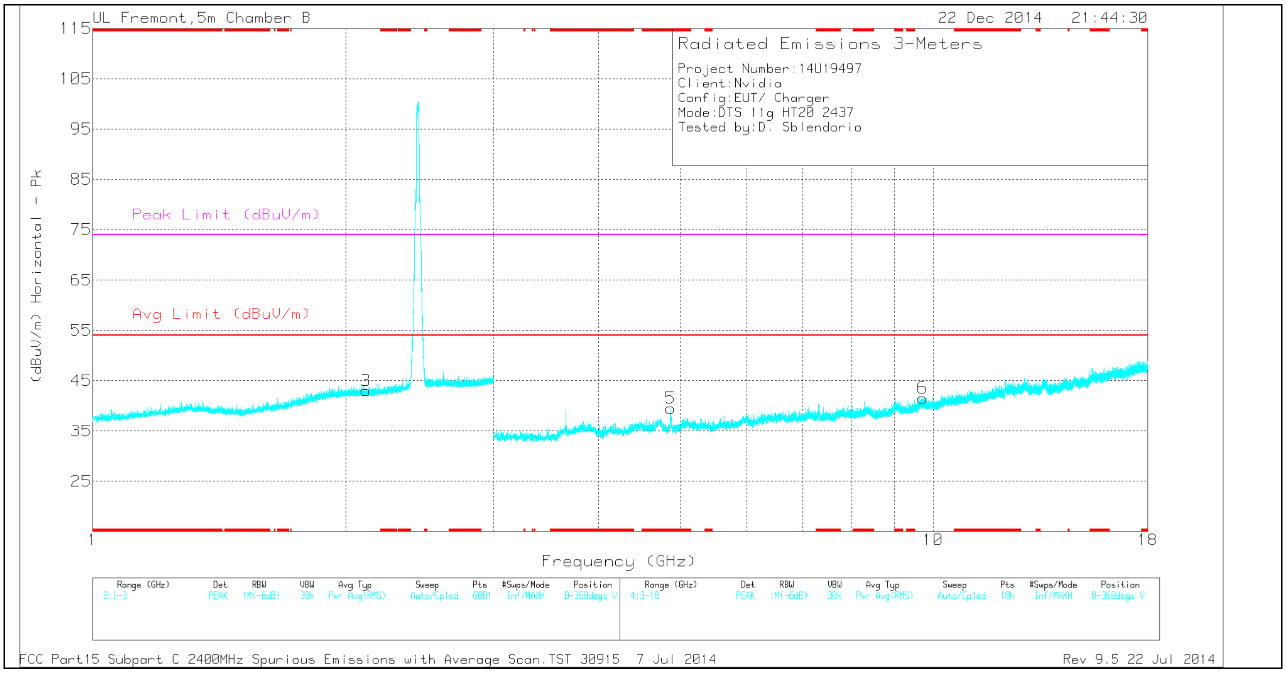
Radiated Emissions 3-Meters
Project Number:14U19497
Client:Nvidia
Config:EUT/ Charger
Mode:DTS 11g HT20 2437
Tested by:D. Sblendorio

Range (GHz)	Det	RBW	VBW	Avg Typ	Sweep	Pts	#Swps/Mode	Position
1:1-3	PEAK	1M(-6dB)	30k	Pwr Avg(RMS)	Auto/Cpled	6001	Inf/MAXH	0-360degs H
3:3-18	PEAK	1M(-6dB)	30k	Pwr Avg(RMS)	Auto/Cpled	18k	Inf/MAXH	0-360degs H

FCC Part15 Subpart C 2400MHz Spurious Emissions with Average Scan.TST 30915 7 Jul 2014
Rev 9.5 22 Jul 2014

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

MID CHANNEL VERTICAL



UL Fremont,5m Chamber B 22 Dec 2014 21:44:30

Radiated Emissions 3-Meters

Project Number:14U19497
Client:Nvidia
Config:EUT/ Charger
Mode:DTS 11g HT20 2437
Tested by:D. Sblendorio

Range (GHz)	Det	RBW	VBW	Avg Typ	Sweep	Pts	#Swps/Mode	Position
2:1-3	PEAK	1M(-6dB)	30k	Pwr Avg(RMS)	Auto/Cpled	6001	Inf/MAXH	0-360degs V
4:3-18	PEAK	1M(-6dB)	30k	Pwr Avg(RMS)	Auto/Cpled	18k	Inf/MAXH	0-360degs V

FCC Part15 Subpart C 2400MHz Spurious Emissions with Average Scan.TST 30915 7 Jul 2014 Rev 9.5 22 Jul 2014

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

MID CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.384	35.26	PK	28.6	-24.3	0	39.56	-	-	74	-34.44	0-360	101	H
2	* 2.825	35.48	PK	32.4	-22.3	0	45.58	-	-	74	-28.42	0-360	200	H
4	* 3.656	38.71	PK	33.2	-31	0	40.91	-	-	74	-33.09	0-360	199	H
5	* 4.871	35.94	PK	34.2	-30.6	0	39.54	-	-	74	-34.46	0-360	199	V
3	2.115	34.82	PK	31.3	-23.1	0	43.02	-	-	-	-	0-360	200	V
6	9.725	28.87	PK	36.9	-24.2	0	41.57	-	-	-	-	0-360	101	V

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK - Peak detector

Radiated Emissions

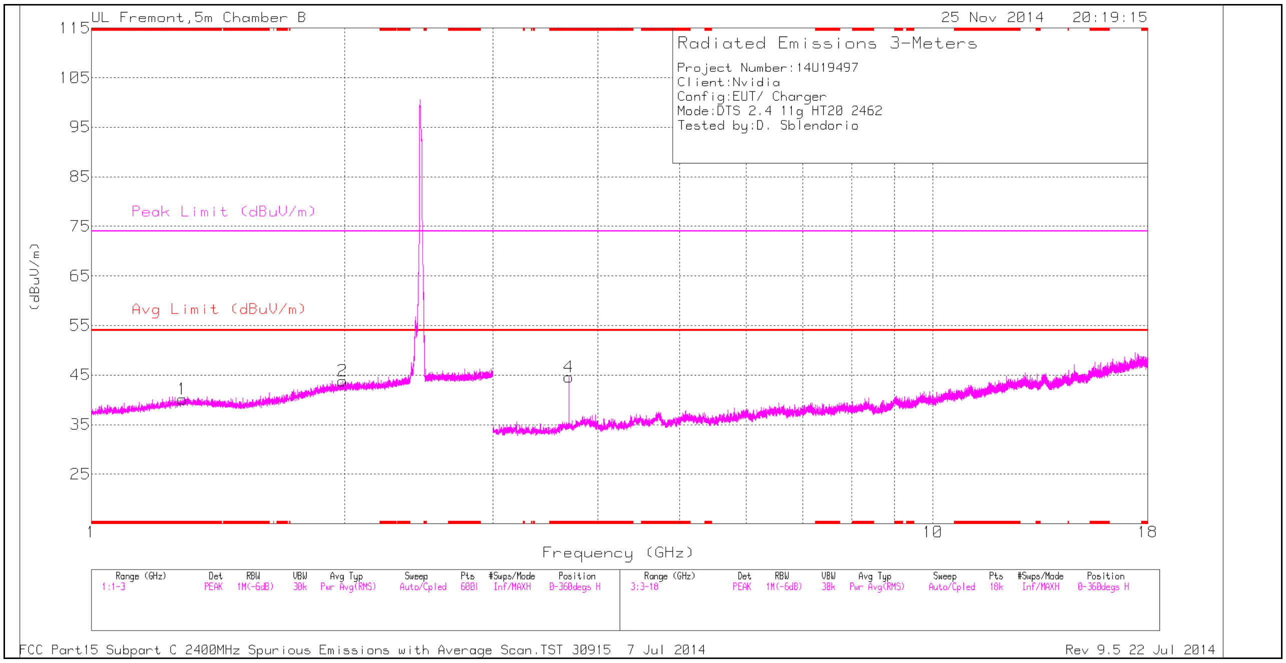
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 3.655	43.42	PK2	33.2	-31	0	45.62	-	-	74	-28.38	359	198	H
* 3.655	36.01	MAv1	33.2	-31	.29	38.5	54	-15.5	-	-	359	198	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

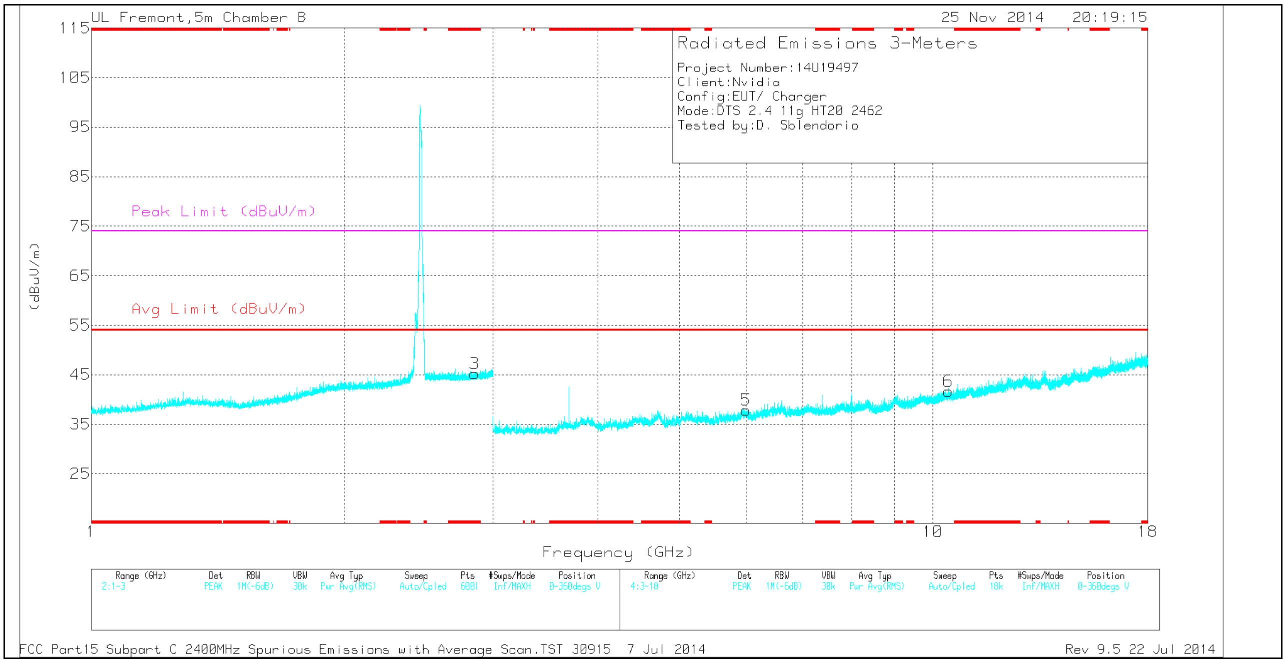
RMS - RMS detection

HIGH CHANNEL HORIZONTAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

HIGH CHANNEL VERTICAL



Range (GHz)	Det	RBW	VBW	Avg Typ	Sweep	Pts	#Swps/Mode	Position
2:1-3	PEAK	1M(-6dB)	30k	Pwr Avg(RMS)	Auto/Cpled	6001	Inf/MAXH	0-360degs V
4:3-18	PEAK	1M(-6dB)	30k	Pwr Avg(RMS)	Auto/Cpled	18k	Inf/MAXH	0-360degs V

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

HIGH CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.283	35.83	PK	28.7	-24.4	0	40.13	-	-	74	-33.87	0-360	101	H
3	* 2.854	35.06	PK	32.5	-22.3	0	45.26	-	-	74	-28.74	0-360	101	V
4	* 3.693	42.71	PK	33.3	-31.4	0	44.61	-	-	74	-29.39	0-360	199	H
2	1.988	35.83	PK	31.3	-23.3	0	43.83	-	-	-	-	0-360	101	H
5	5.995	31.48	PK	35.2	-28.8	0	37.88	-	-	-	-	0-360	101	V
6	10.432	27.77	PK	37.4	-23.5	0	41.67	-	-	-	-	0-360	101	V

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 3.694	41.86	PK2	33.3	-31.4	0	43.76	-	-	74	-30.24	359	198	H
* 3.693	31.02	MAv1	33.3	-31.4	.29	33.21	54	-20.79	-	-	359	198	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

RMS - RMS detection

14. RADIATED TEST RESULTS MIMO 802.11n Mode

14.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements and add duty cycle factor for average measurements. Duty cycle factor= 10log (1/x) For this sample B mode = 0dB (duty cycle >98%); G mode = 0.3dB; N HT20 mode = 0.30dB; N HT40 mode=0.14dB.

The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

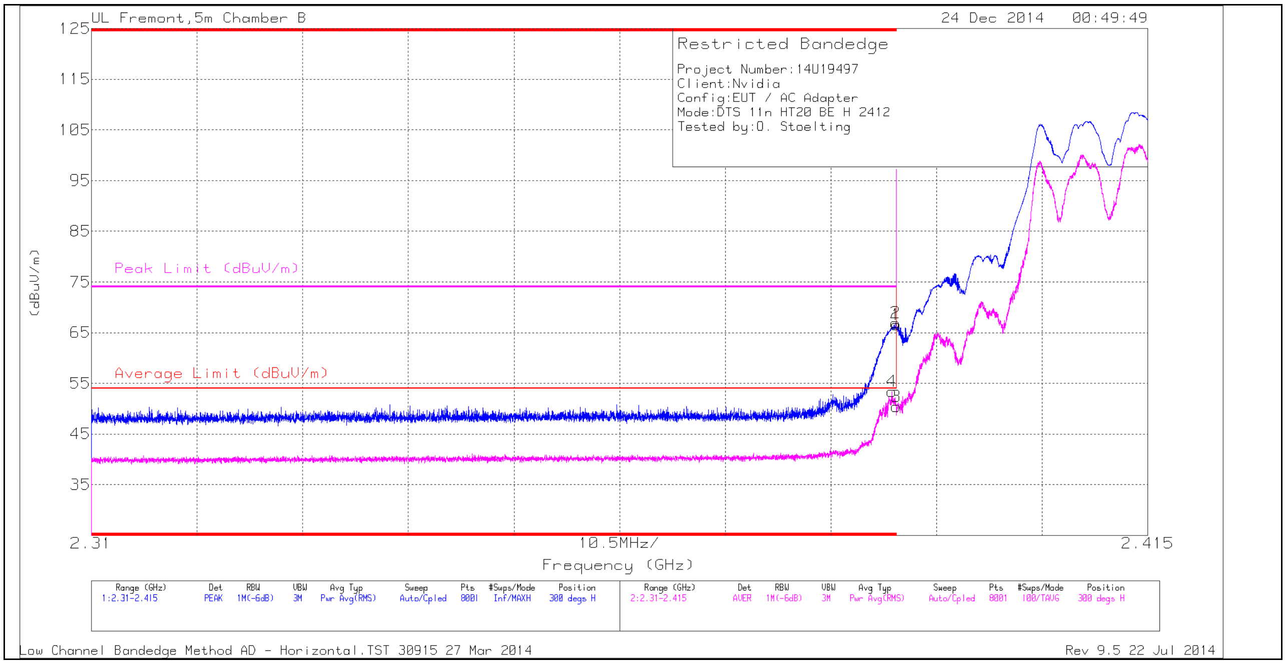
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

14.2. TRANSMITTER ABOVE 1 GHz

14.2.1. TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 2.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

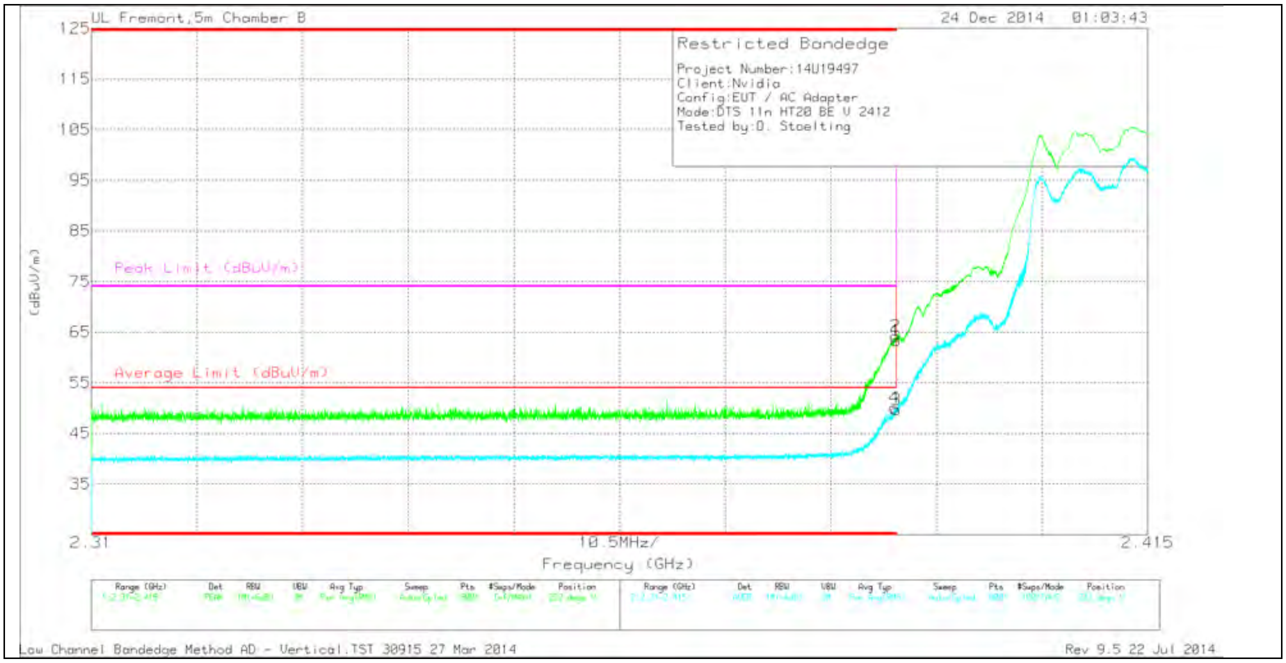
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Flt r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	57.16	PK	32.1	-22.7	0	66.56	-	-	74	-7.44	300	326	H
2	* 2.39	57.55	PK	32.1	-22.7	0	66.95	-	-	74	-7.05	300	326	H
3	* 2.39	40.66	RMS	32.1	-22.7	0.3	50.36	54	-3.64	-	-	300	326	H
4	* 2.39	43.745	RMS	32.1	-22.7	0.3	53.45	54	-.55	-	-	300	326	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	53.89	PK	32.1	-22.7	0	63.29	-	-	74	-10.71	222	342	V
2	* 2.39	54.74	PK	32.1	-22.7	0	64.14	-	-	74	-9.86	222	342	V
3	* 2.39	39.97	RMS	32.1	-22.7	0.3	49.67	54	-4.33	-	-	222	342	V
4	* 2.39	40.29	RMS	32.1	-22.7	0.3	49.99	54	-4.01	-	-	222	342	V

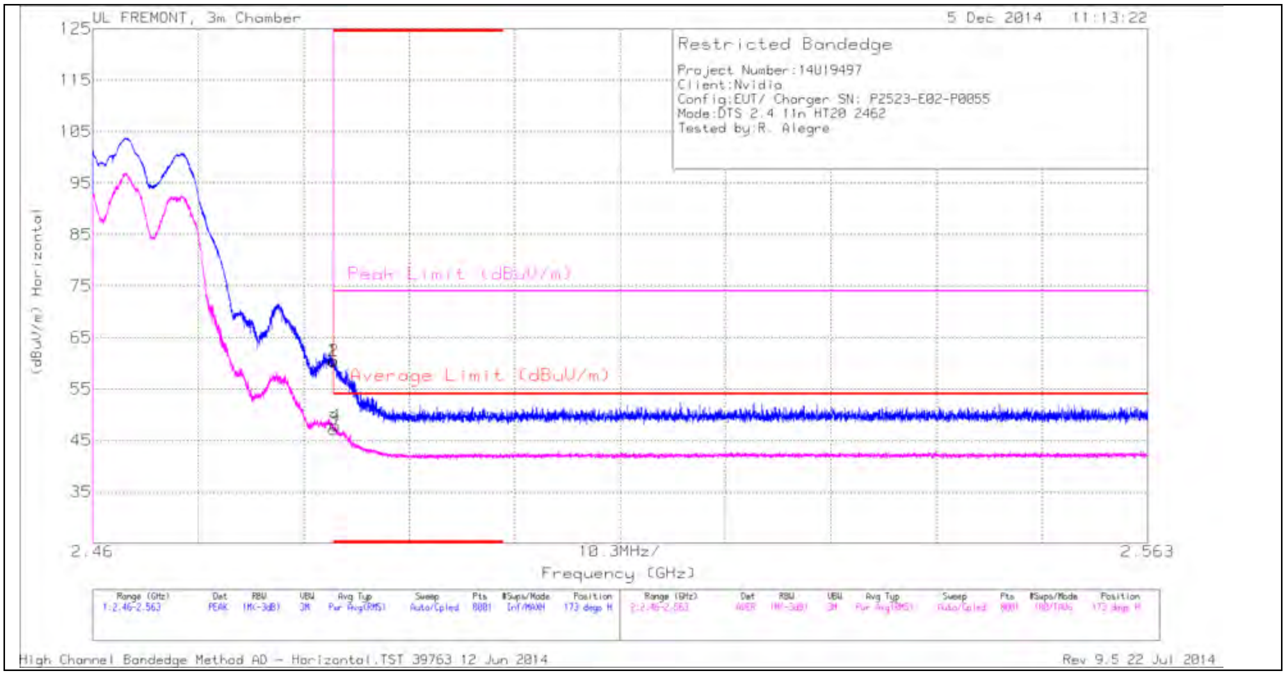
* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK - Peak detector

RMS - RMS detection

AUTHORIZED BANDEDGE (HIGH CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

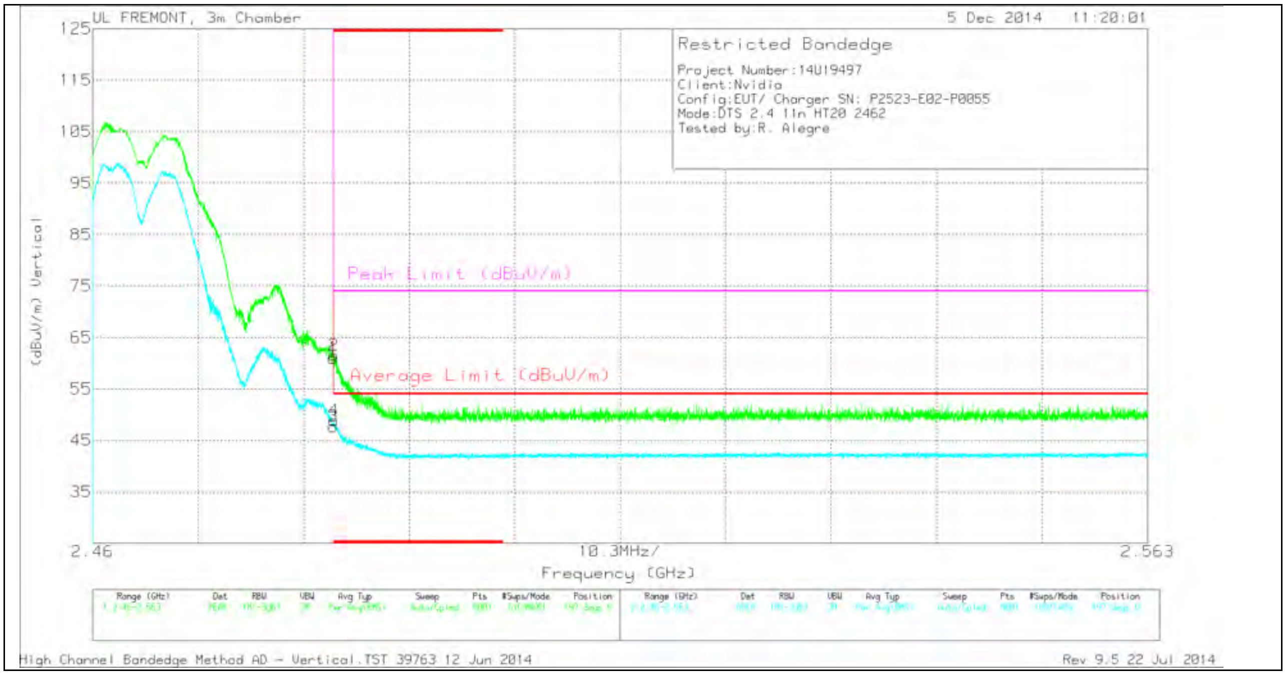
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	50.92	PK	32.3	-22.8	0	60.42	-	-	74	-13.58	173	271	H
2	* 2.484	50.97	PK	32.3	-22.8	0	60.47	-	-	74	-13.53	173	271	H
3	* 2.484	37.42	RMS	32.3	-22.8	0.3	47.22	54	-6.78	-	-	173	271	H
4	* 2.484	38.13	RMS	32.3	-22.8	0.3	47.93	54	-6.07	-	-	173	271	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	51.53	PK	32.3	-22.8	0	61.03	-	-	74	-12.97	197	225	V
2	* 2.484	52.04	PK	32.3	-22.8	0	61.54	-	-	74	-12.46	197	225	V
3	* 2.484	37.95	RMS	32.3	-22.8	0.3	47.75	54	-6.25	-	-	197	225	V
4	* 2.484	39.1	RMS	32.3	-22.8	0.3	48.9	54	-5.1	-	-	197	225	V

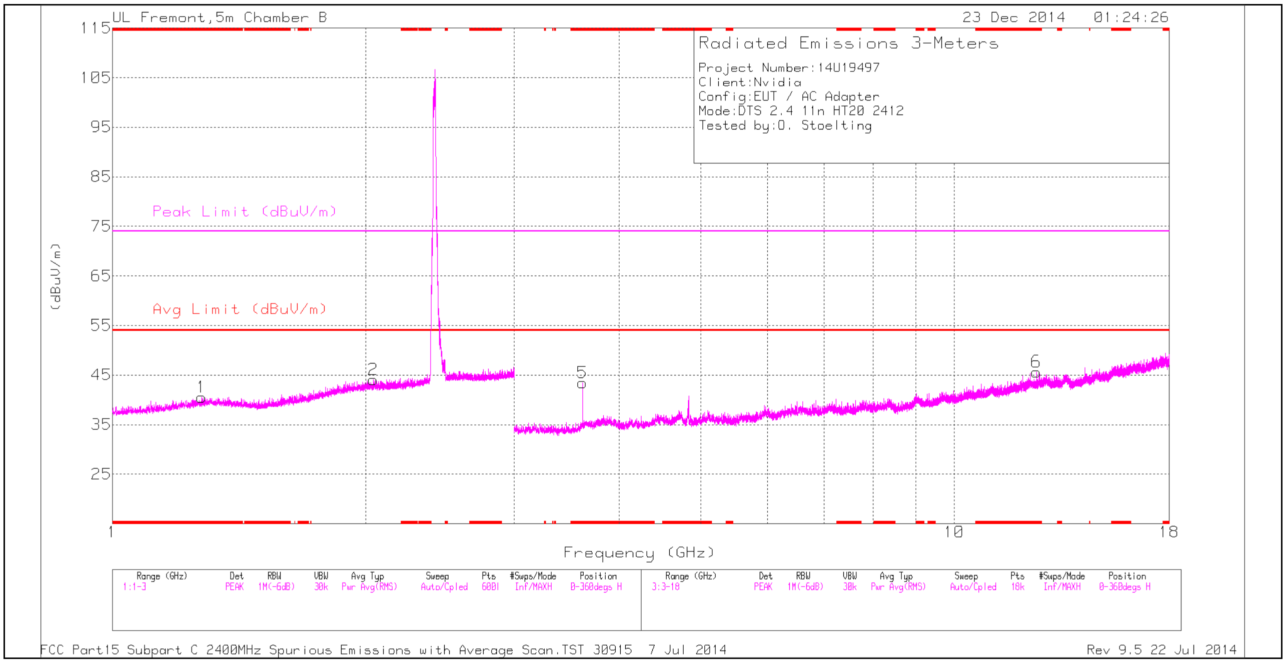
* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK - Peak detector

RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



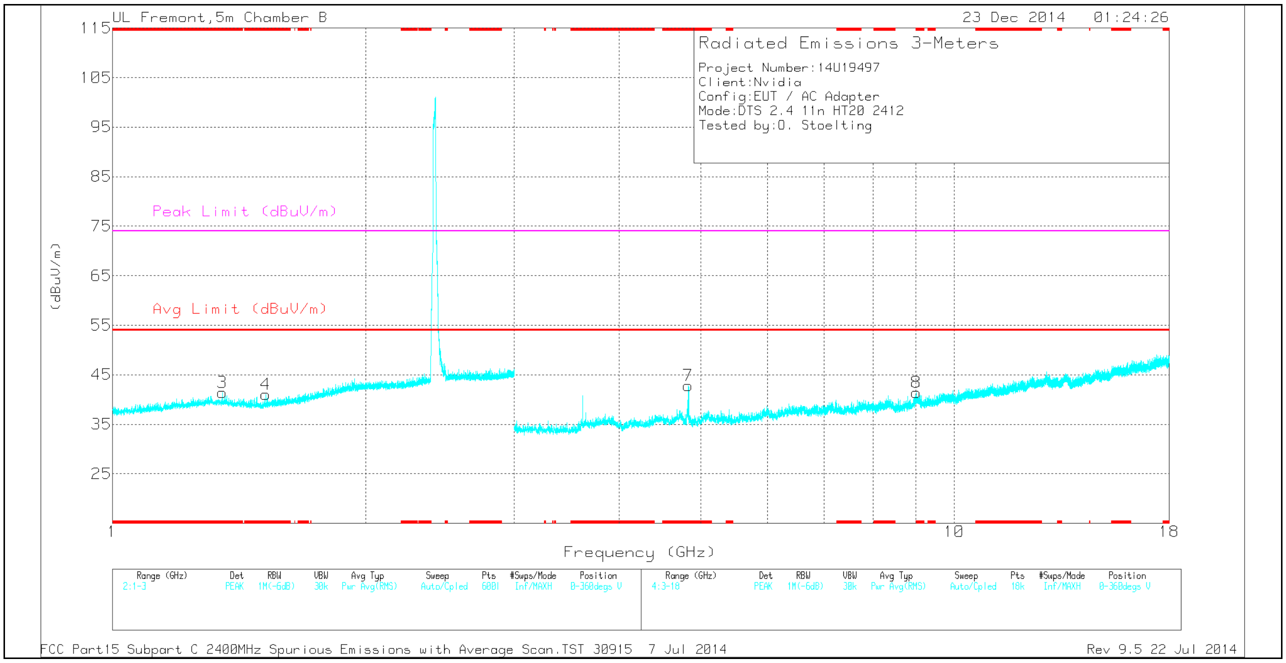
Radiated Emissions 3-Meters
Project Number:14U19497
Client:Nvidia
Config:EUT / AC Adapter
Mode:DTS 2.4 11n HT20 2412
Tested by:O. Stoelting

Range (GHz)	Det	RBW	VBW	Avg Typ	Sweep	Pts	#Swps/Mode	Position
1:1-3	PEAK	1M(-6dB)	30k	Pwr Avg(RMS)	Auto/Cpled	6001	Inf/MAXH	0-360degs H
3:3-18	PEAK	1M(-6dB)	30k	Pwr Avg(RMS)	Auto/Cpled	18k	Inf/MAXH	0-360degs H

FCC Part15 Subpart C 2400MHz Spurious Emissions with Average Scan.TST 30915 7 Jul 2014 Rev 9.5 22 Jul 2014

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

LOW CHANNEL VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

LOW CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.276	36.13	PK	28.7	-24.3	0	40.53	-	-	74	-33.47	0-360	199	H
3	* 1.35	37.07	PK	28.7	-24.3	0	41.47	-	-	74	-32.53	0-360	101	V
4	* 1.521	36.89	PK	28	-23.9	0	40.99	-	-	74	-33.01	0-360	199	V
5	* 3.617	41.14	PK	33.2	-30.9	0	43.44	-	-	74	-30.56	0-360	200	H
6	* 12.512	29.06	PK	39	-22.4	0	45.66	-	-	74	-28.34	0-360	200	H
7	* 4.833	38.72	PK	34.2	-30.1	0	42.82	-	-	74	-31.18	0-360	200	V
8	* 9.012	29.46	PK	36.2	-24.3	0	41.36	-	-	74	-32.64	0-360	101	V
2	2.04	36.06	PK	31.3	-23.3	0	44.06	-	-	-	-	0-360	101	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK - Peak detector

Radiated Emissions

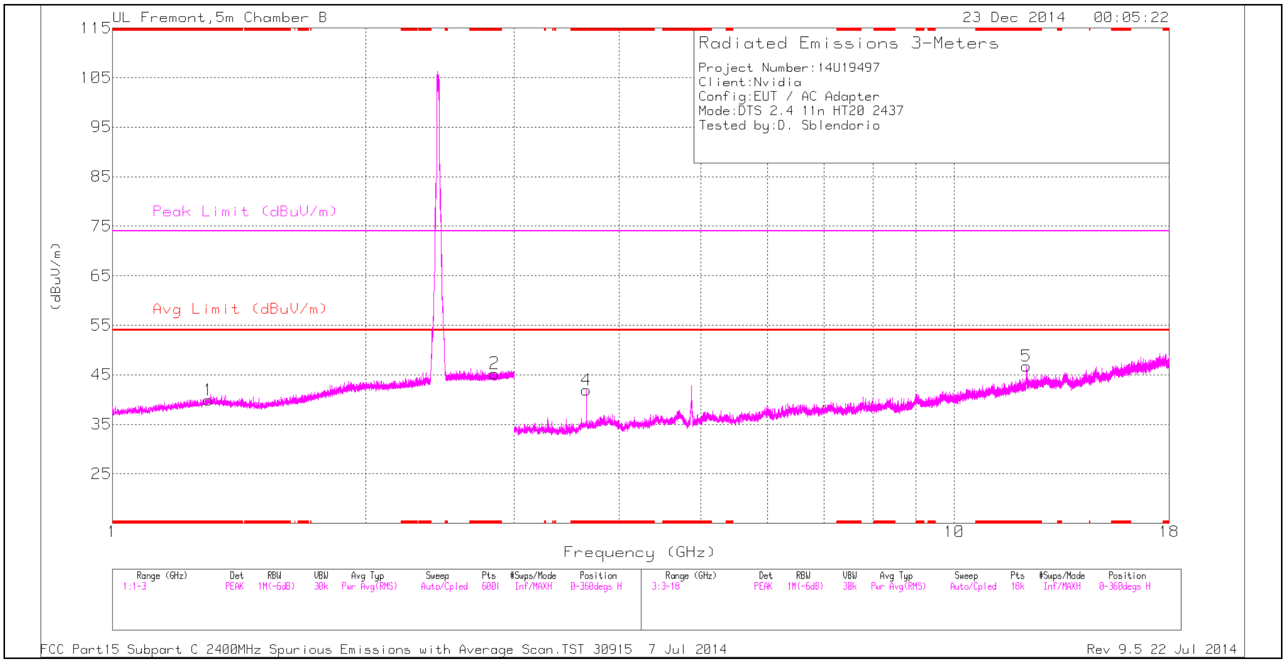
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 3.618	44.51	PK2	33.2	-30.9	0	46.81	-	-	74	-27.19	251	269	H
* 3.618	38.89	MAv1	33.2	-30.9	.3	41.49	54	-12.51	-	-	251	269	H
* 4.833	46.01	PK2	34.2	-30.2	0	50.01	-	-	74	-23.99	221	217	V
* 4.833	32.78	MAv1	34.2	-30.1	.3	37.18	54	-16.82	-	-	221	217	V

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

RMS - RMS detection

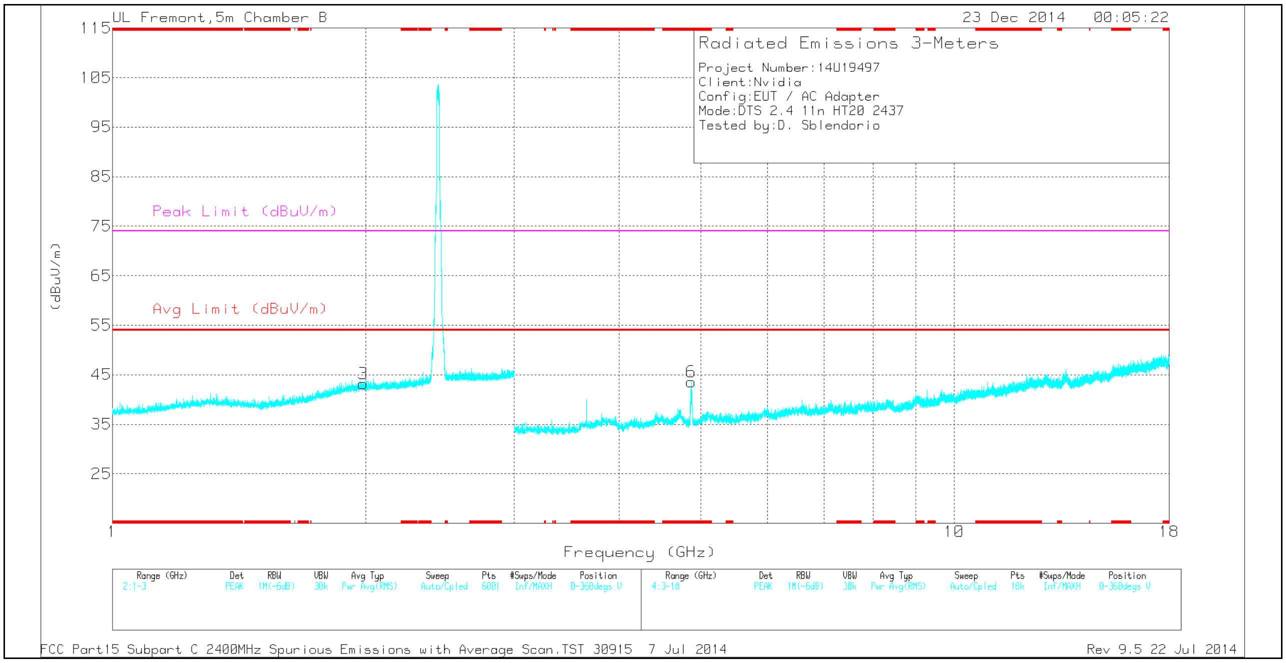
MID CHANNEL HORIZONTAL



Range (GHz)	Det	RBW	VBW	Avg Typ	Sweep	Pts	#Swps/Mode	Position
1:1-3	PEAK	1M(-6dB)	30k	Pwr Avg(RMS)	Auto/Cpled	6001	Inf/MAXH	0-360degs H
3:3-18	PEAK	1M(-6dB)	30k	Pwr Avg(RMS)	Auto/Cpled	18k	Inf/MAXH	0-360degs H

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

MID CHANNEL VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

MID CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.301	35.33	PK	28.9	-24.3	0	39.93	-	-	74	-34.07	0-360	101	H
2	* 2.842	35.08	PK	32.5	-22.3	0	45.28	-	-	74	-28.72	0-360	101	H
4	* 3.656	39.75	PK	33.2	-31	0	41.95	-	-	74	-32.05	0-360	199	H
5	* 12.179	30.46	PK	38.9	-22.6	0	46.76	-	-	74	-27.24	0-360	199	H
6	* 4.872	39.95	PK	34.2	-30.6	0	43.55	-	-	74	-30.45	0-360	101	V
3	1.986	35.23	PK	31.3	-23.3	0	43.23	-	-	-	-	0-360	199	V

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK - Peak detector

Radiated Emissions

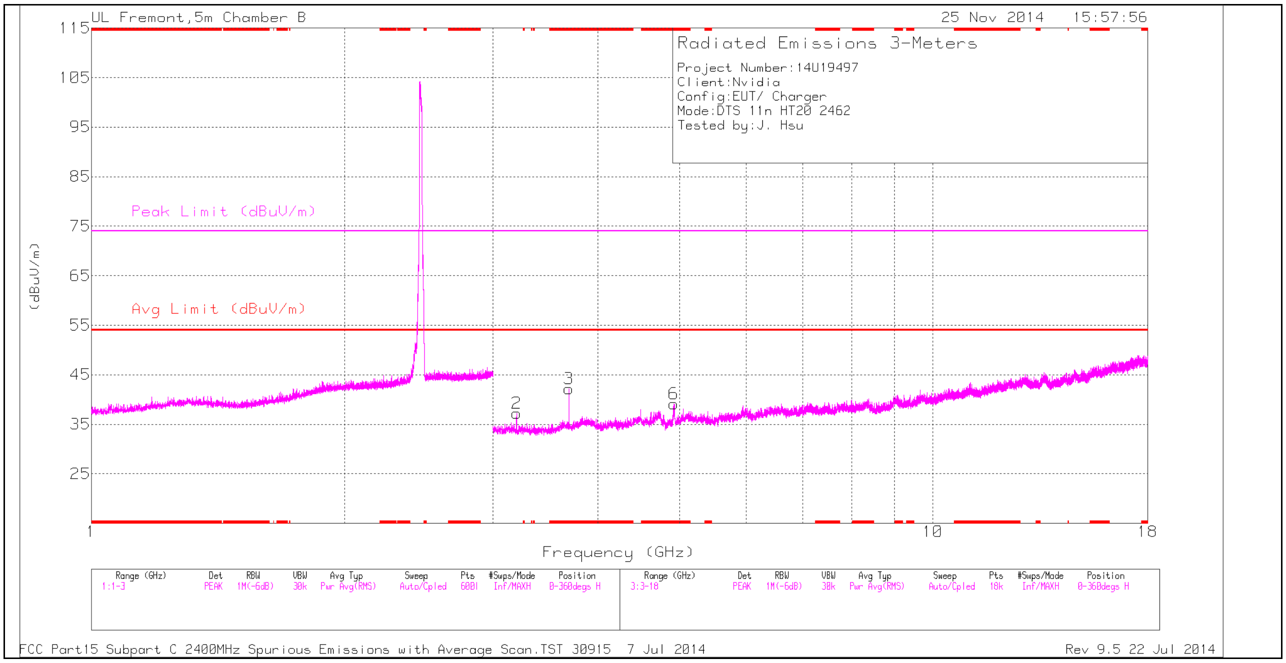
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.873	49.46	PK2	34.2	-30.6	0	53.06	-	-	74	-20.94	310	200	V
* 4.873	36.65	MAv1	34.2	-30.6	.3	40.55	54	-13.45	-	-	310	200	V

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

RMS - RMS detection

HIGH CHANNEL HORIZONTAL



Radiated Emissions 3-Meters

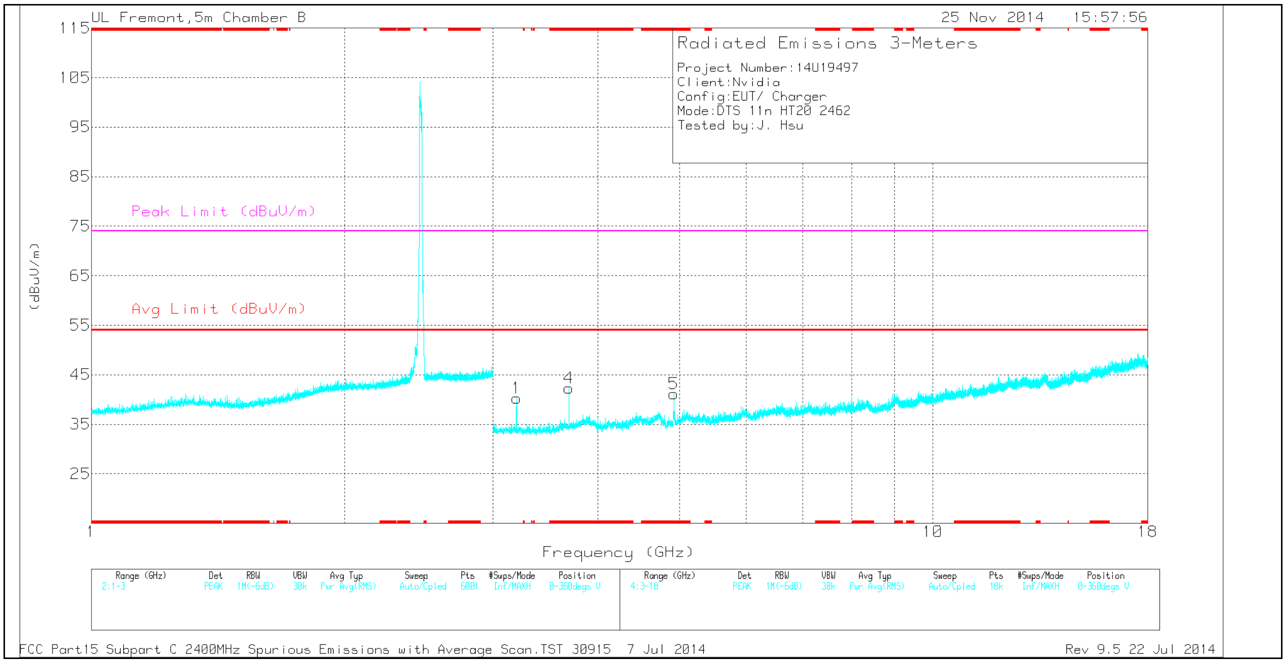
Project Number:14U19497
Client:Nvidia
Config:EUT/ Charger
Mode:DTS 11n HT20 2462
Tested by:J. Hsu

Range (GHz)	Det	RBW	VBW	Avg Typ	Sweep	Pts	#Swps/Mode	Position
1:1-3	PEAK	1M(-6dB)	30k	Pwr Avg(RMS)	Auto/Cpled	6001	Inf/MAXH	0-360degs H
3:3-18	PEAK	1M(-6dB)	30k	Pwr Avg(RMS)	Auto/Cpled	18k	Inf/MAXH	0-360degs H

FCC Part15 Subpart C 2400MHz Spurious Emissions with Average Scan.TST 30915 7 Jul 2014 Rev 9.5 22 Jul 2014

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

HIGH CHANNEL VERTICAL



Range (GHz)	Det	RBW	VBW	Avg Typ	Sweep	Pts	#Swps/Mode	Position
2:1-3	PEAK	1M(-6dB)	30k	Pwr Avg(RMS)	Auto/Cpled	6001	Inf/MAXH	0-360degs V
4:3-18	PEAK	1M(-6dB)	30k	Pwr Avg(RMS)	Auto/Cpled	18k	Inf/MAXH	0-360degs V

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

HIGH CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
3	* 3.693	40.27	PK	33.3	-31.4	0	42.17	-	-	74	-31.83	0-360	199	H
6	* 4.922	35.8	PK	34.2	-30.9	0	39.1	-	-	74	-34.9	0-360	101	H
4	* 3.693	40.45	PK	33.3	-31.4	0	42.35	-	-	74	-31.65	0-360	199	V
5	* 4.925	37.85	PK	34.2	-30.9	0	41.15	-	-	74	-32.85	0-360	199	V
2	3.2	35.49	PK	32.8	-31.1	0	37.19	-	-	-	-	0-360	199	H
1	3.2	38.53	PK	32.8	-31.1	0	40.23	-	-	-	-	0-360	199	V

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.929	45.1	PK2	34.2	-30.9	0	48.4	-	-	74	-25.6	35	221	V
* 4.924	33.64	MAv1	34.2	-30.9	.3	39.24	54	-16.76	-	-	35	221	V

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

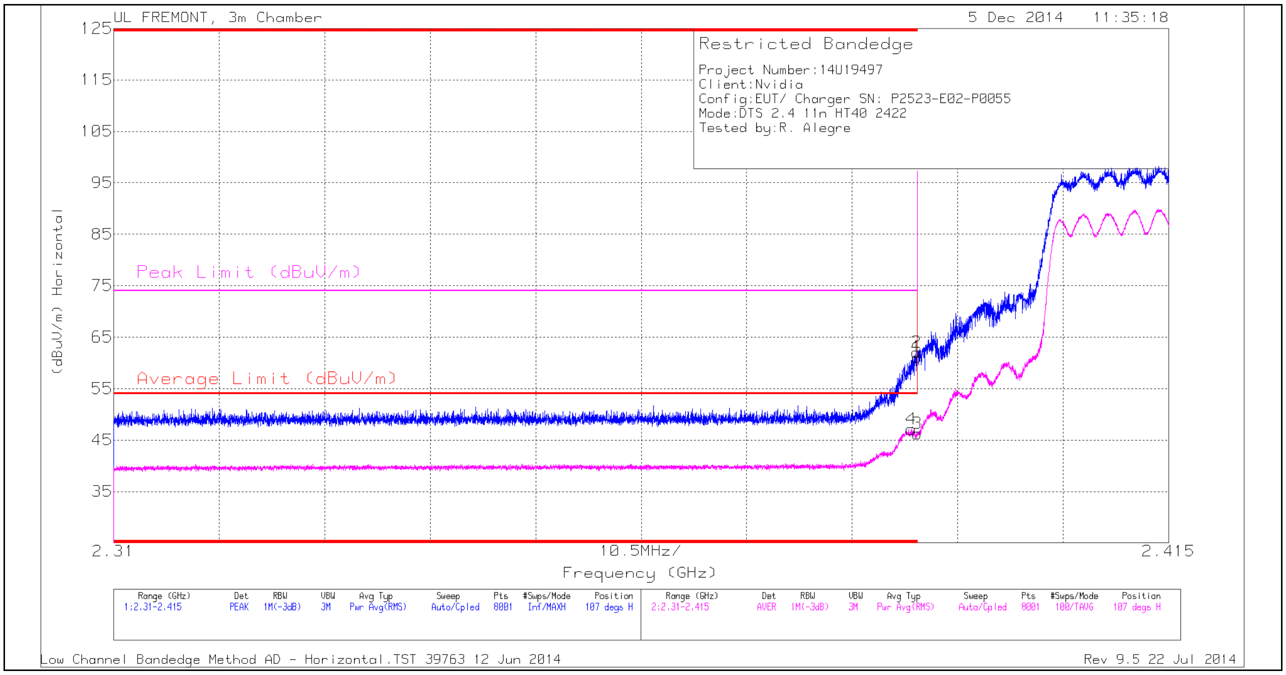
Pk - Peak detector

RMS - RMS detection

1.1.1. TX ABOVE 1 GHz 802.11n HT40 MODE IN THE 2.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

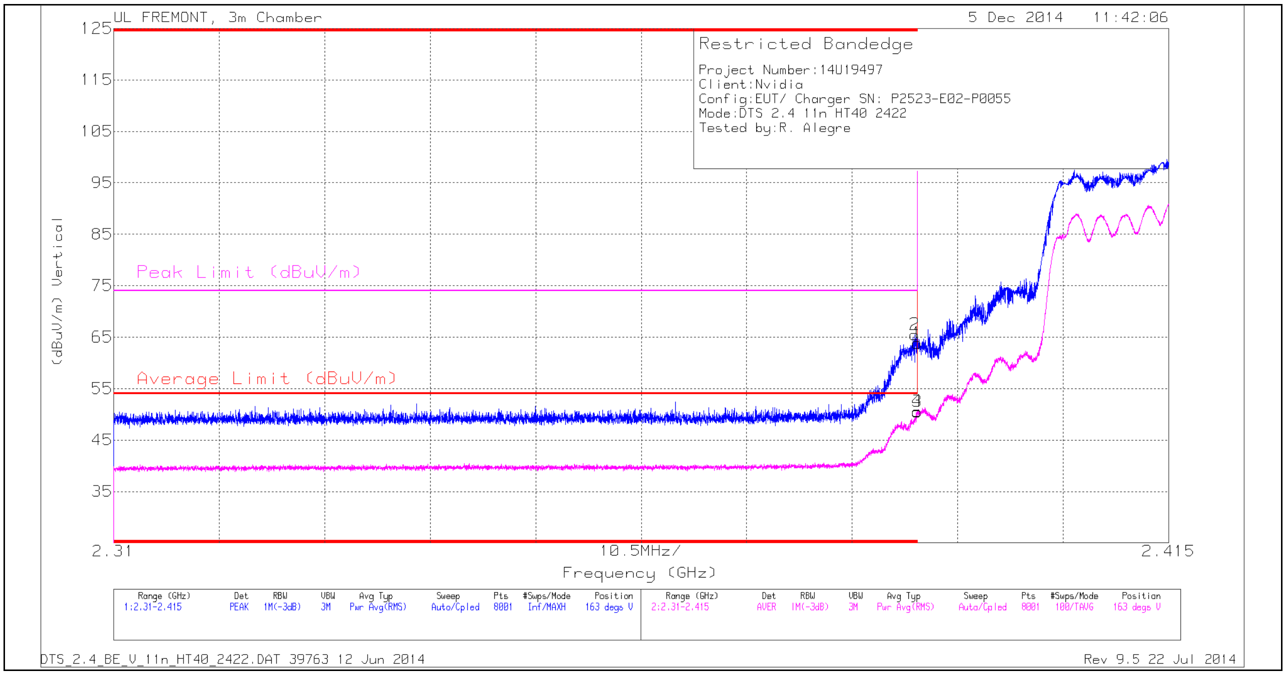
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Flt r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	52.13	PK	32.1	-23.1	0	61.13	-	-	74	-12.87	107	159	H
2	* 2.39	53.04	PK	32.1	-23.1	0	62.04	-	-	74	-11.96	107	159	H
3	* 2.39	37.12	RMS	32.1	-23.1	.14	46.26	54	-7.74	-	-	107	159	H
4	* 2.389	37.96	RMS	32.1	-23.1	.14	47.1	54	-6.9	-	-	107	159	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	54.84	PK	32.1	-23.1	0	63.84	-	-	74	-10.16	163	143	V
2	* 2.39	56.5	PK	32.1	-23.1	0	65.5	-	-	74	-8.5	163	143	V
3	* 2.39	41.37	RMS	32.1	-23.1	.14	50.51	54	-3.49	-	-	163	143	V
4	* 2.39	41.47	RMS	32.1	-23.1	.14	50.61	54	-3.39	-	-	163	143	V

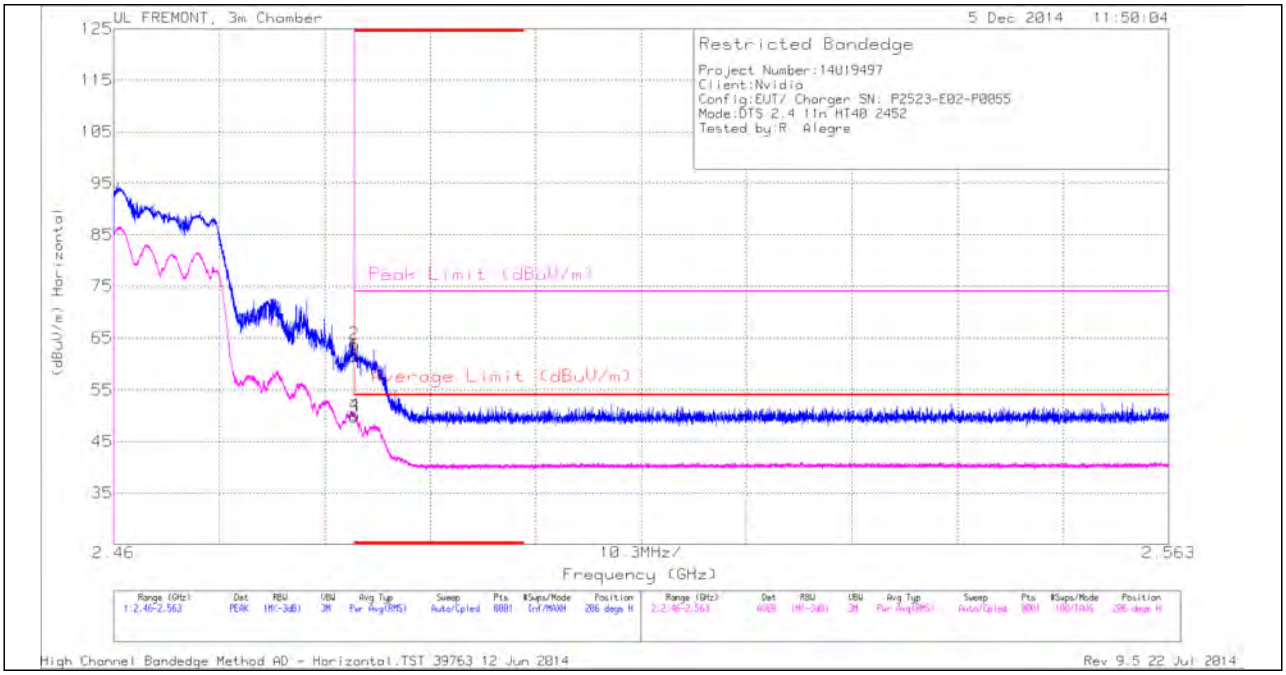
* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK - Peak detector

RMS - RMS detection

AUTHORIZED BANDEDGE (HIGH CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



Restricted Bandedge
Project Number:14U19497
Client:Nvidia
Config:EUT/ Charger SN: P2523-E02-P0055
Mode:DTS 2.4 11n HT40 2452
Tested by:R. Alegre

HORIZONTAL DATA

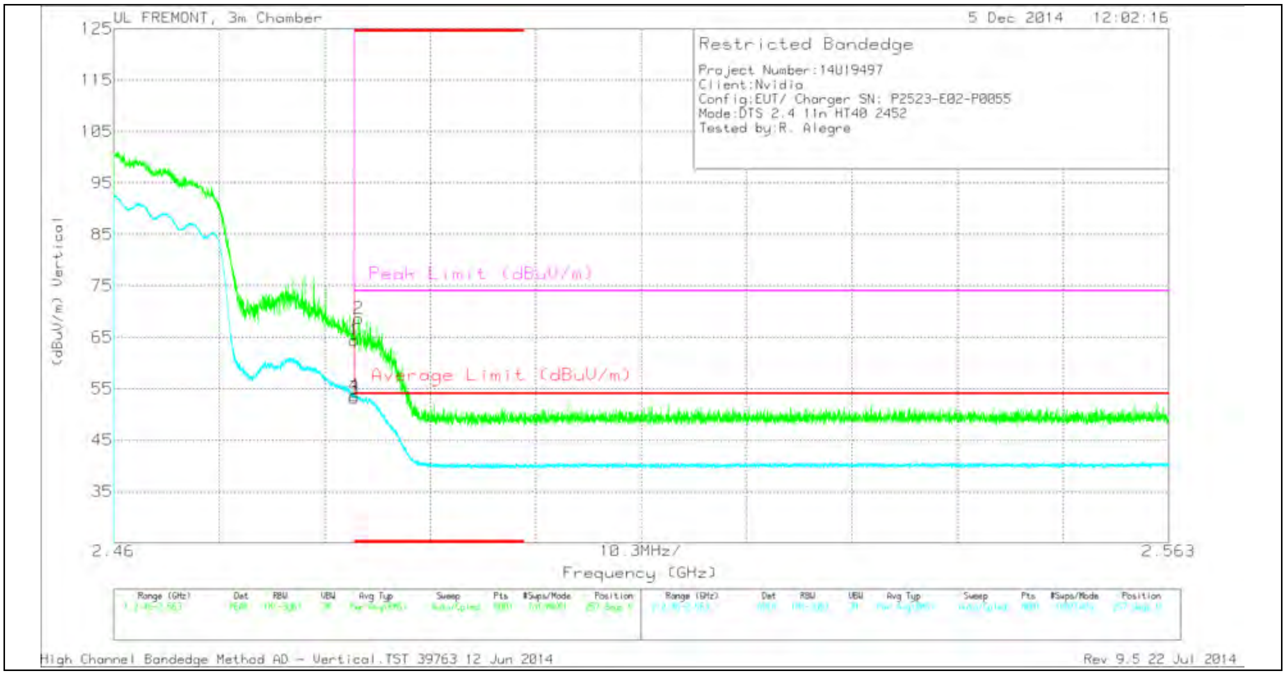
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	52.09	PK	32.3	-22.8	0	61.59	-	-	74	-12.41	206	235	H
2	* 2.484	54.29	PK	32.3	-22.8	0	63.79	-	-	74	-10.21	206	235	H
3	* 2.484	40.12	RMS	32.3	-22.8	.14	49.76	54	-4.24	-	-	206	235	H
4	* 2.484	40.47	RMS	32.3	-22.8	.14	50.11	54	-3.89	-	-	206	235	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	54.92	PK	32.3	-22.8	0	64.42	-	-	74	-9.58	257	100	V
2	* 2.484	59.18	PK	32.3	-22.8	0	68.68	-	-	74	-5.32	257	100	V
3	* 2.484	43.54	RMS	32.3	-22.8	.14	53.18	54	-.82	-	-	257	100	V
4	* 2.484	44.02	RMS	32.3	-22.8	.14	53.66	54	-.34	-	-	257	100	V

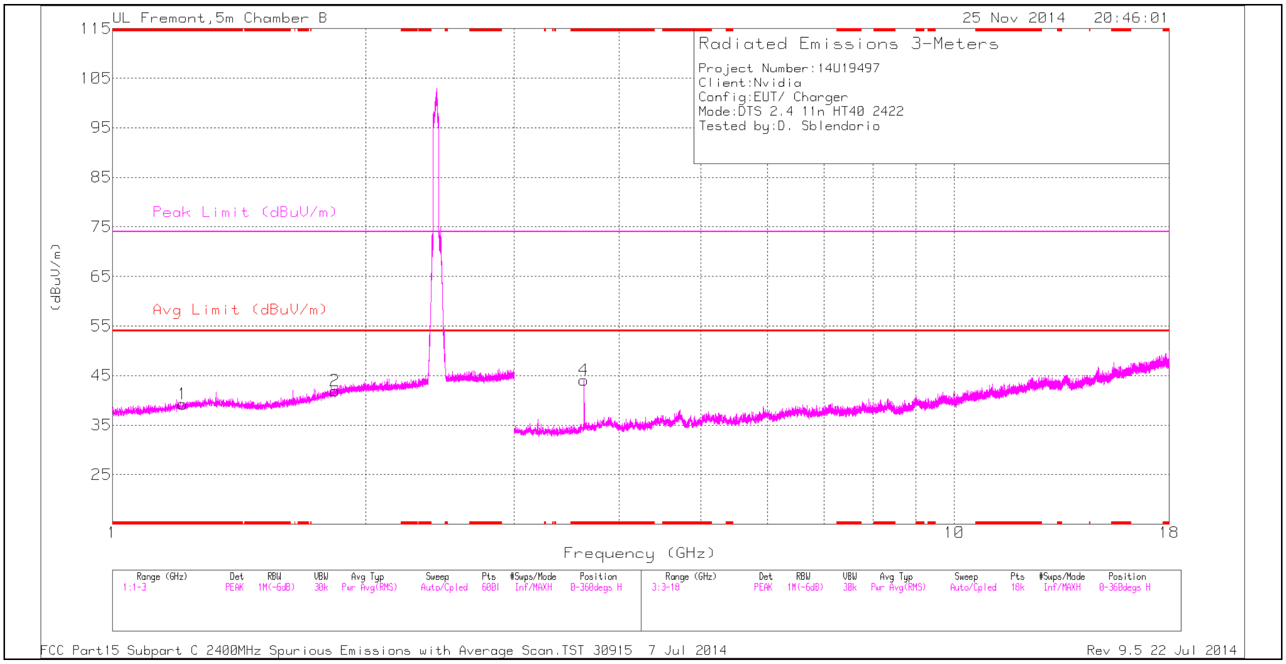
* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK - Peak detector

RMS - RMS detection

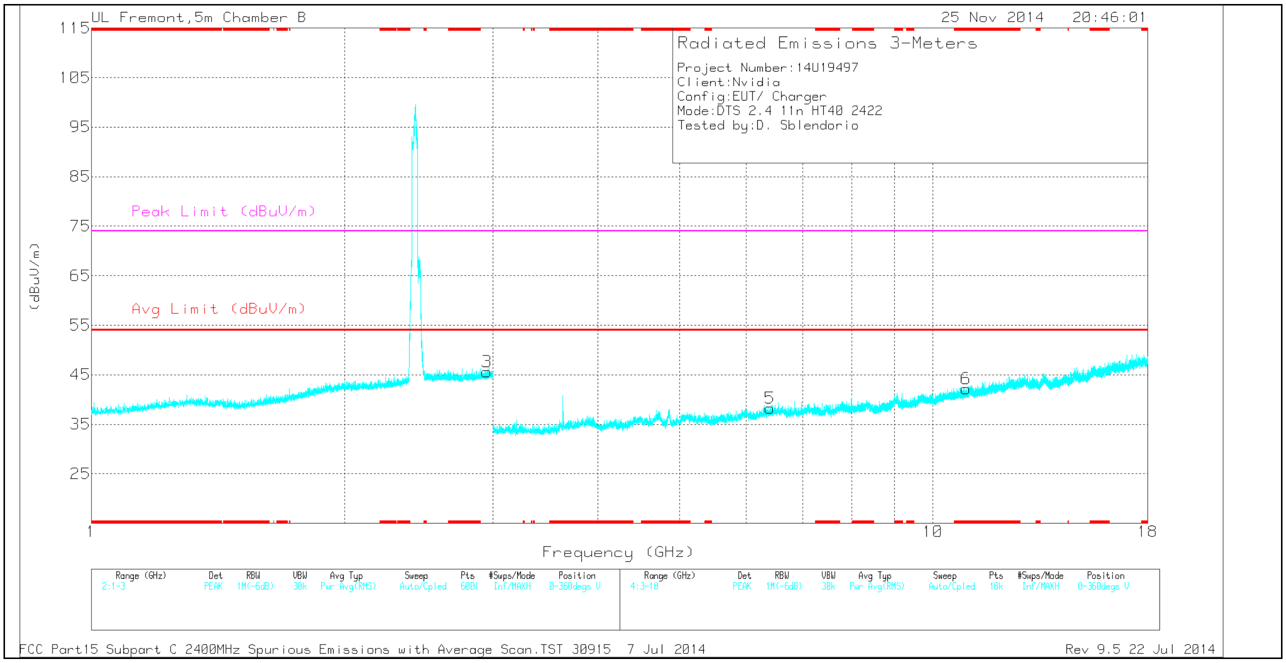
HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

LOW CHANNEL VERTICAL



Range (GHz)	Det	RBW	VBW	Avg Typ	Sweep	Pts	#Swps/Mode	Position
2:1-3	PEAK	1M(-6dB)	30k	Pwr Avg(RMS)	Auto/Cpled	6001	Inf/MAXH	0-360degs V
4:3-18	PEAK	1M(-6dB)	30k	Pwr Avg(RMS)	Auto/Cpled	18k	Inf/MAXH	0-360degs V

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

LOW CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.212	35.32	PK	28.3	-24.4	0	39.22	-	-	74	-34.78	0-360	199	H
4	* 3.633	41.84	PK	33.2	-31	0	44.04	-	-	74	-29.96	0-360	199	H
6	* 10.956	27.56	PK	37.8	-23.2	0	42.16	-	-	74	-31.84	0-360	101	V
2	1.839	34.97	PK	30.5	-23.5	0	41.97	-	-	-	-	0-360	199	H
3	2.951	35.15	PK	32.7	-22.3	0	45.55	-	-	-	-	0-360	101	V
5	6.401	32.01	PK	35.6	-29.4	0	38.21	-	-	-	-	0-360	101	V

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK - Peak detector

Radiated Emissions

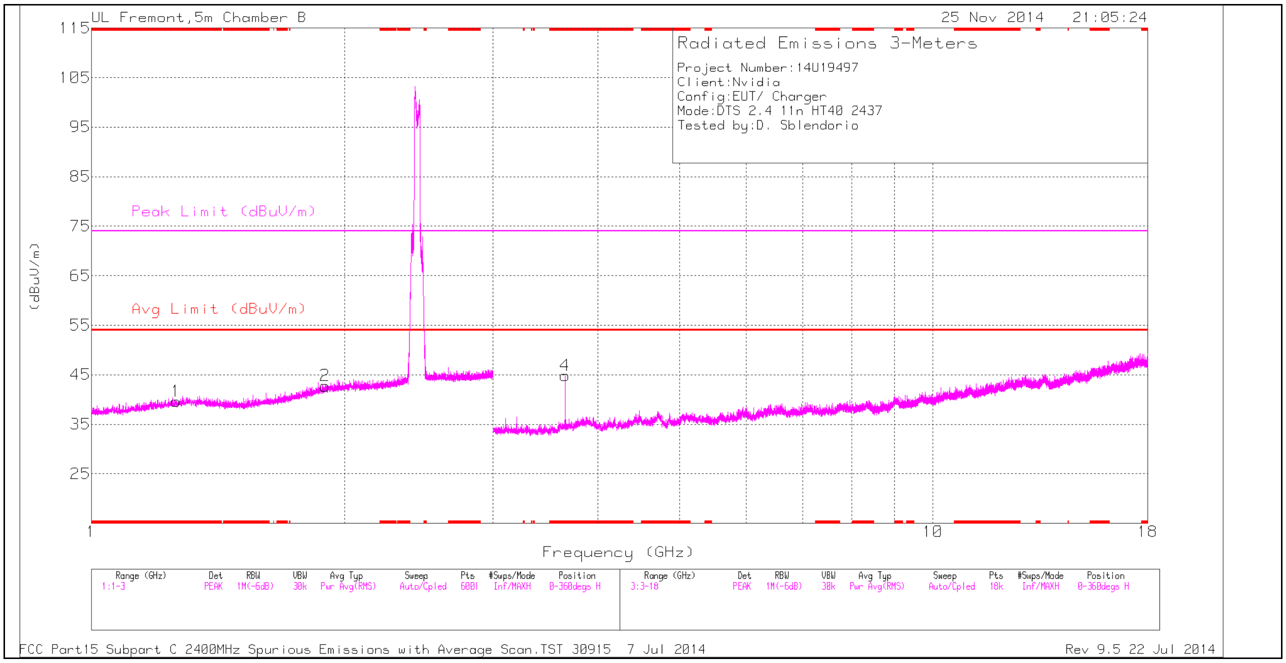
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 3.635	41.26	PK2	33.2	-31	0	43.46	-	-	74	-30.54	360	199	H
* 3.633	31.39	MAv1	33.2	-31	.14	33.73	54	-20.27	-	-	360	199	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

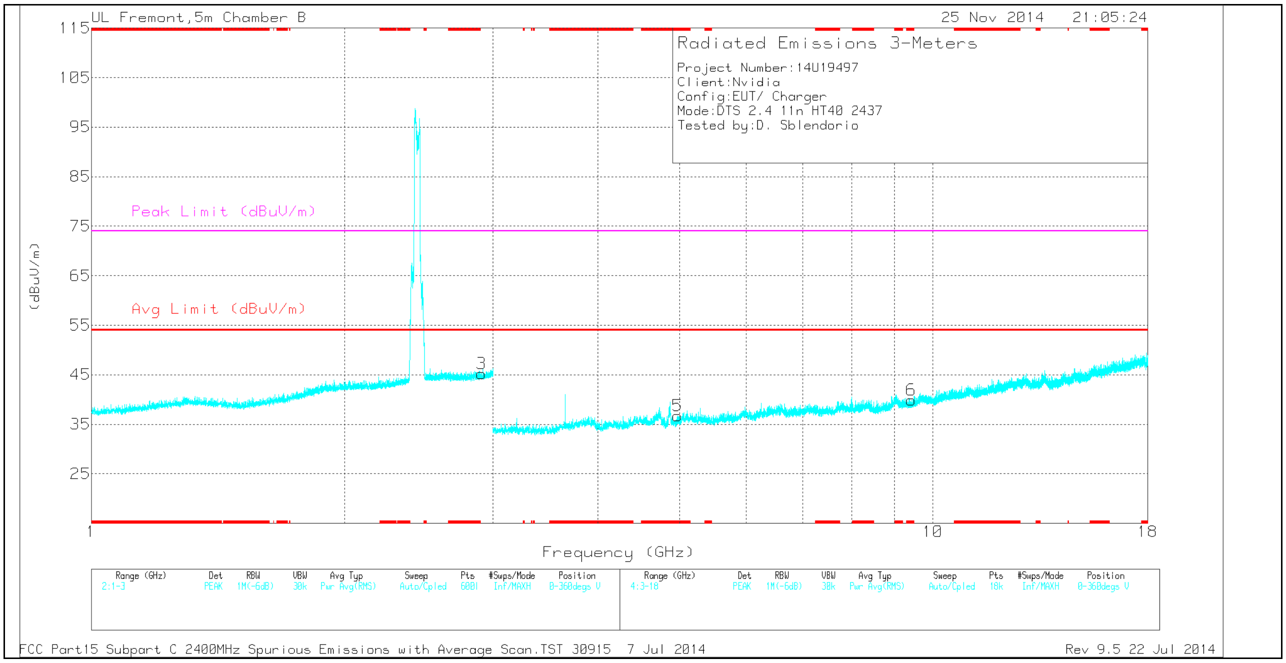
RMS - RMS detection

MID CHANNEL HORIZONTAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

MID CHANNEL VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

MID CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.262	35.41	PK	28.6	-24.4	0	39.61	-	-	74	-34.39	0-360	101	H
4	* 3.656	42.67	PK	33.2	-31	0	44.87	-	-	74	-29.13	0-360	199	H
5	* 4.977	32.68	PK	34.2	-30.2	0	36.68	-	-	74	-37.32	0-360	101	V
6	* 9.434	28.42	PK	36.5	-25	0	39.92	-	-	74	-34.08	0-360	101	V
2	1.894	35.15	PK	31	-23.4	0	42.75	-	-	-	-	0-360	101	H
3	2.906	34.79	PK	32.6	-22.2	0	45.19	-	-	-	-	0-360	199	V

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK - Peak detector

Radiated Emissions

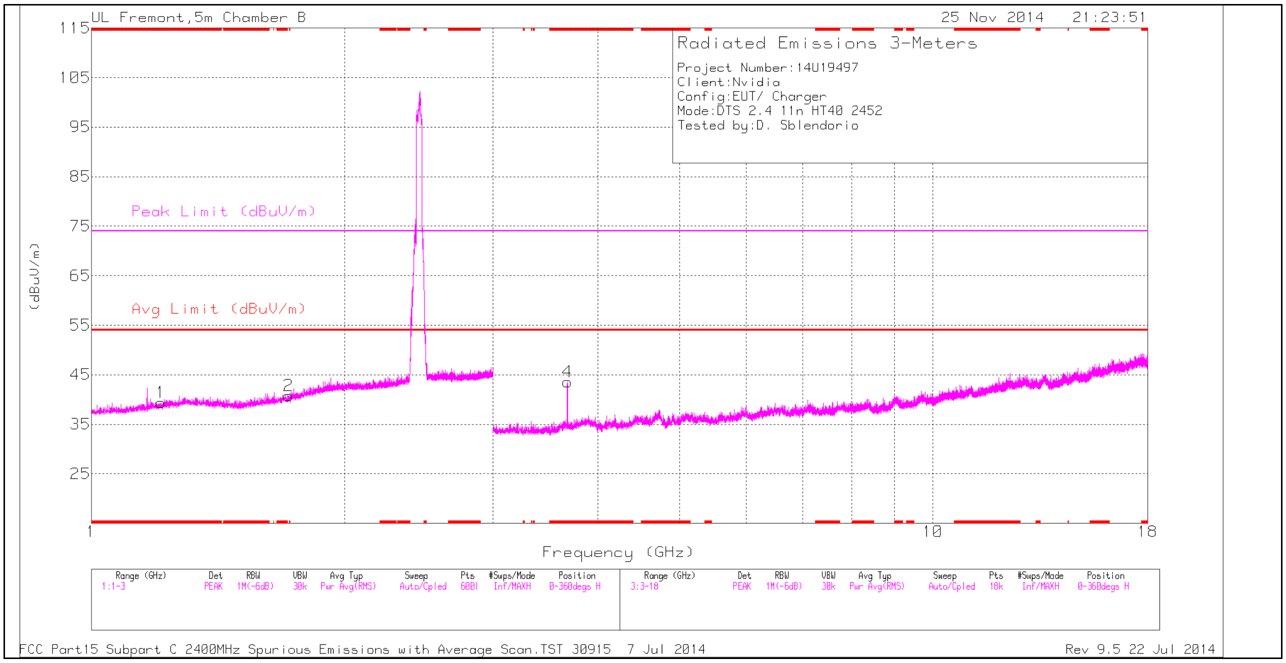
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 3.655	41.42	PK2	33.2	-31	0	43.62	-	-	74	-30.38	359	199	H
* 3.656	31.49	MAv1	33.2	-31	.14	33.83	54	-20.17	-	-	359	199	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

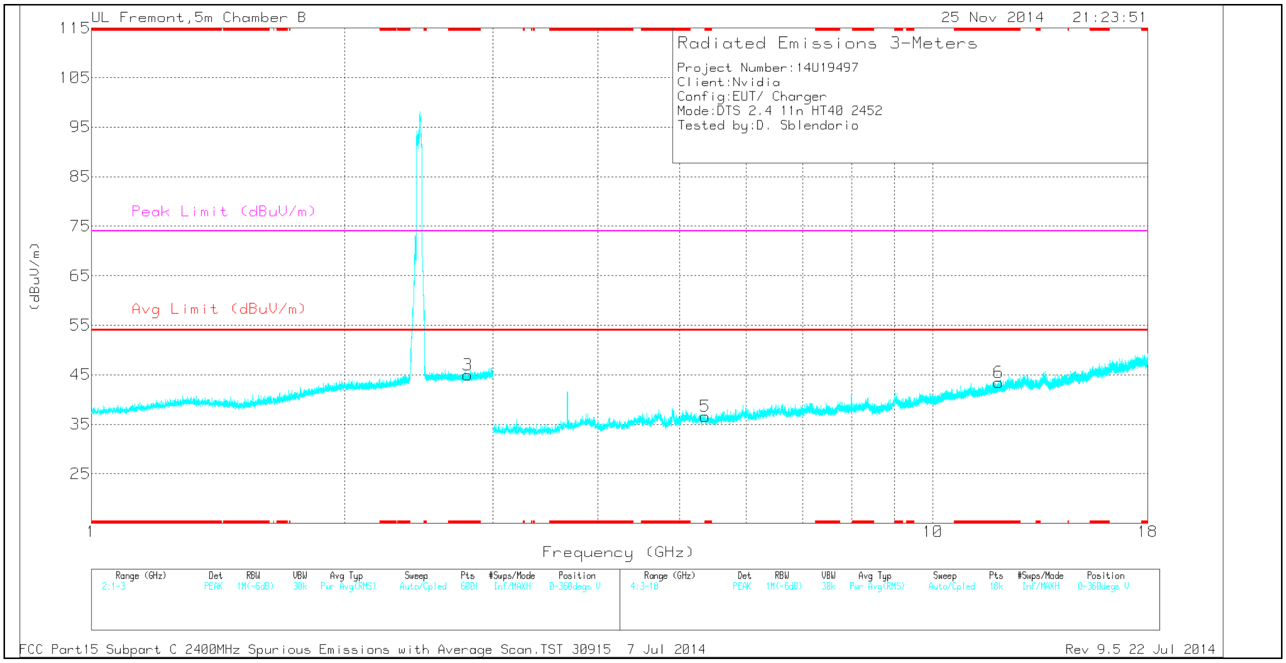
RMS - RMS detection

HIGH CHANNEL HORIZONTAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

HIGH CHANNEL VERTICAL



Range (GHz)	Det	RBW	VBW	Avg Typ	Sweep	Pts	#Swps/Mode	Position
2:1-3	PEAK	1M(-6dB)	30k	Pwr Avg(RMS)	Auto/Cpled	6001	Inf/MAXH	0-360degs V
4:3-18	PEAK	1M(-6dB)	30k	Pwr Avg(RMS)	Auto/Cpled	18k	Inf/MAXH	0-360degs V

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

HIGH CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.211	35.51	PK	28.3	-24.4	0	39.41	-	-	74	-34.59	0-360	199	H
3	* 2.802	34.88	PK	32.3	-22.2	0	44.98	-	-	74	-29.02	0-360	199	V
4	* 3.678	41.52	PK	33.3	-31.2	0	43.62	-	-	74	-30.38	0-360	199	H
5	* 5.362	31.23	PK	34.5	-29.1	0	36.63	-	-	74	-37.37	0-360	101	V
6	* 11.967	26.77	PK	38.7	-22	0	43.47	-	-	74	-30.53	0-360	199	V
2	1.715	35.02	PK	29.2	-23.5	0	40.72	-	-	-	-	0-360	199	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 3.678	41.28	PK2	33.3	-31.2	0	43.38	-	-	74	-30.62	360	198	H
* 3.678	30.35	MAv1	33.3	-31.2	.14	32.59	54	-21.41	-	-	360	198	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

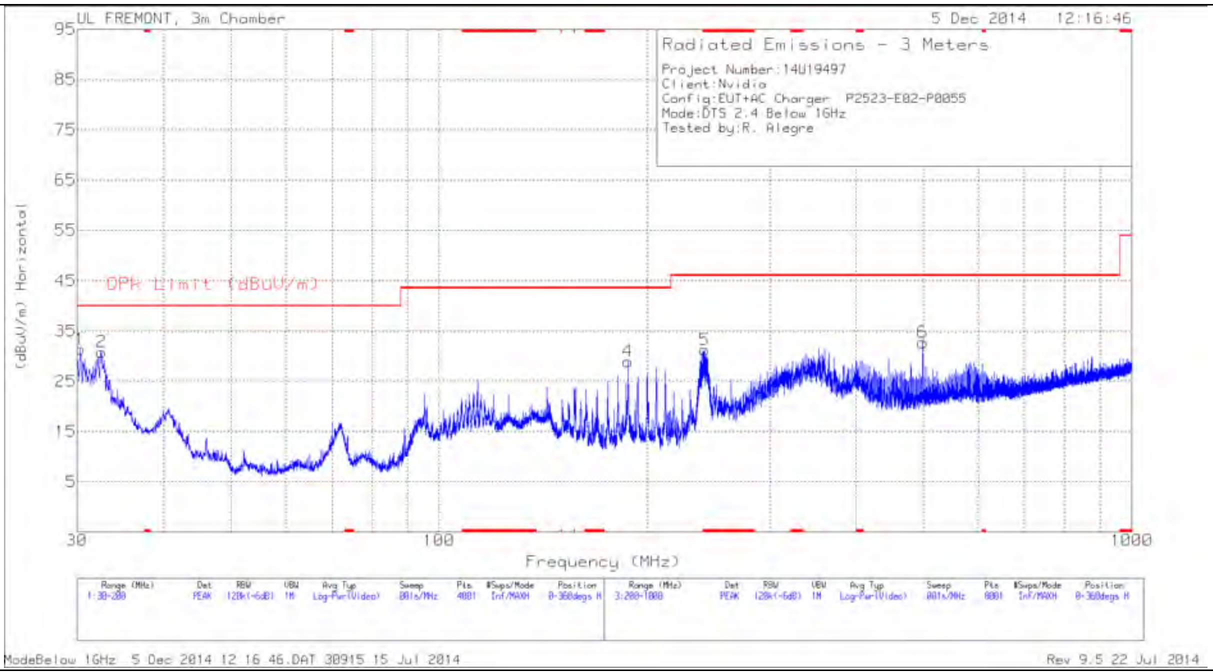
Pk - Peak detector

RMS - RMS detection

1.2. TRANSMITTER BELOW 1 GHz

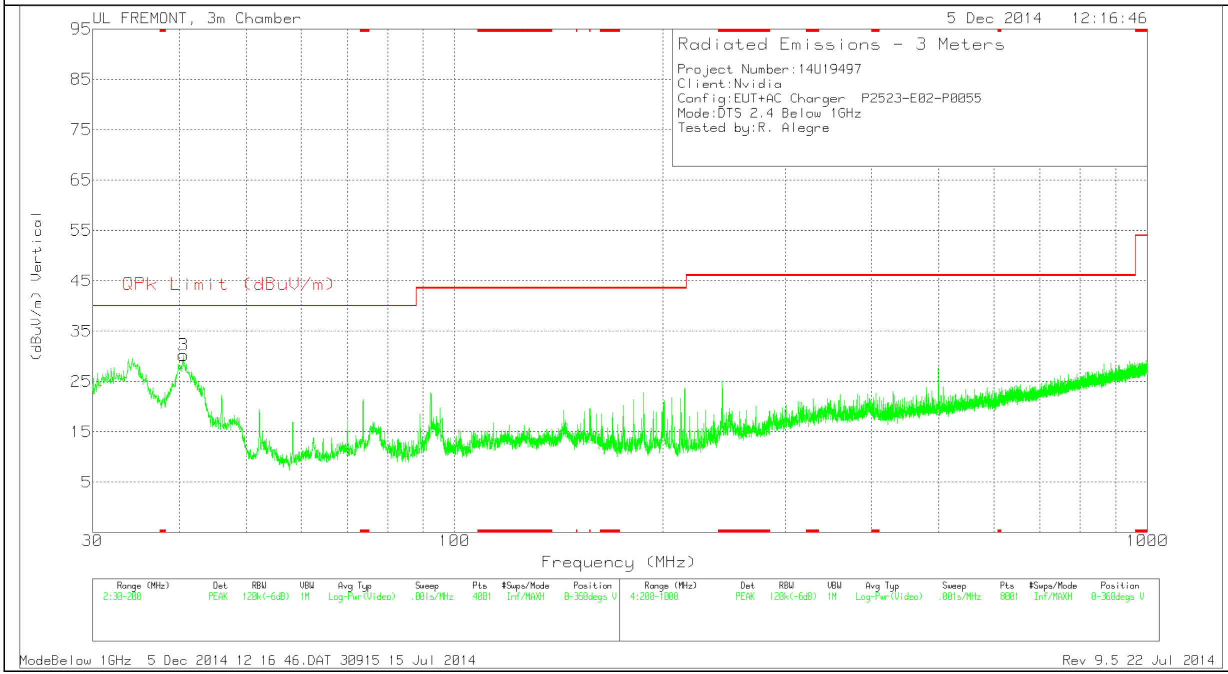
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL PLOT



SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL PLOT



Radiated Emissions - 3 Meters

Project Number:14U19497
Client:Nvidia
Config:EUT+AC Charger P2523-E02-P0055
Mode:DTS 2.4 Below 1GHz
Tested by:R. Alegre

Range (MHz)	Det	RBW	VBW	Avg Typ	Sweep	Pts	#Swps/Mode	Position
2:30-200	PEAK	120k(-6dB)	1M	Log-Pwr(Video)	.001s/MHz	4001	Inf/MAXH	0-360degs V
4:200-1000	PEAK	120k(-6dB)	1M	Log-Pwr(Video)	.001s/MHz	8001	Inf/MAXH	0-360degs V

ModeBelow 1GHz 5 Dec 2014 12 16 46.DAT 30915 15 Jul 2014 Rev 9.5 22 Jul 2014

Below 1G Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T477 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
5	* 241.8	46.05	PK	11.6	-26.4	31.25	46.02	-14.77	0-360	101	H
1	30.34	39.11	PK	21.1	-28.8	31.41	40	-8.59	0-360	101	H
2	32.55	40.13	PK	19.5	-28.8	30.83	40	-9.17	0-360	101	H
3	40.5825	45.53	PK	13.3	-28.6	30.23	40	-9.77	0-360	101	V
4	187.42	44.76	PK	11.2	-27	28.96	43.52	-14.56	0-360	101	H
6	499.2	41.22	PK	17.4	-25.9	32.72	46.02	-13.3	0-360	200	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

15. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

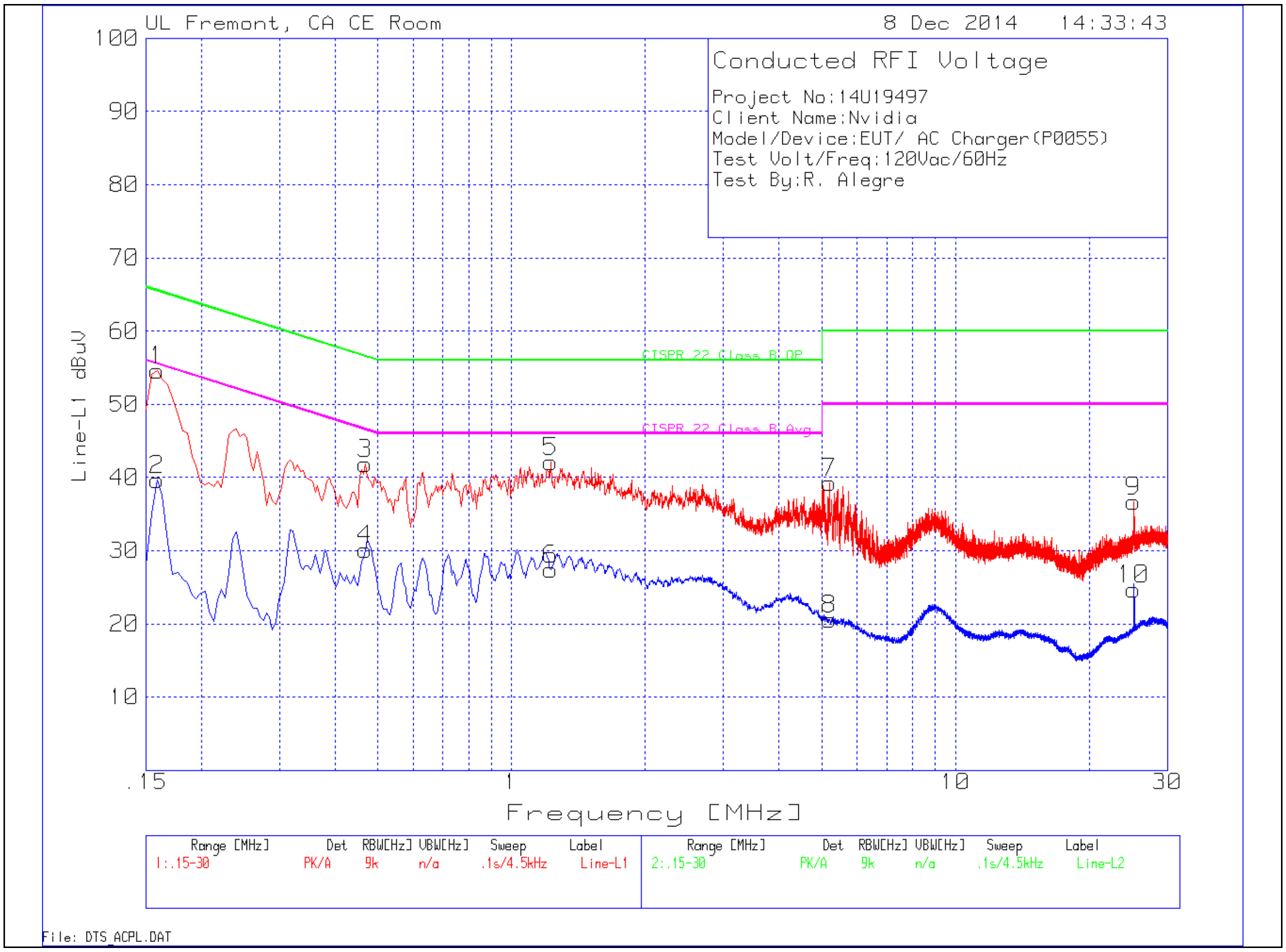
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

RESULTS

6 WORST EMISSIONS

LINE 1 PLOT



Conducted RFI Voltage

Project No:14U19497
Client Name:Nvidia
Model/Device:EUT/ AC Charger(P0055)
Test Volt/Freq:120Vac/60Hz
Test By:R. Alegre

Range [MHz]	Det	RBW[Hz]	VBW[Hz]	Sweep	Label	Range [MHz]	Det	RBW[Hz]	VBW[Hz]	Sweep	Label
1:.15-30	PK/A	9k	n/a	.1s/4.5kHz	Line-L1	2:.15-30	PK/A	9k	n/a	.1s/4.5kHz	Line-L2

File: DTS_ACPL.DAT

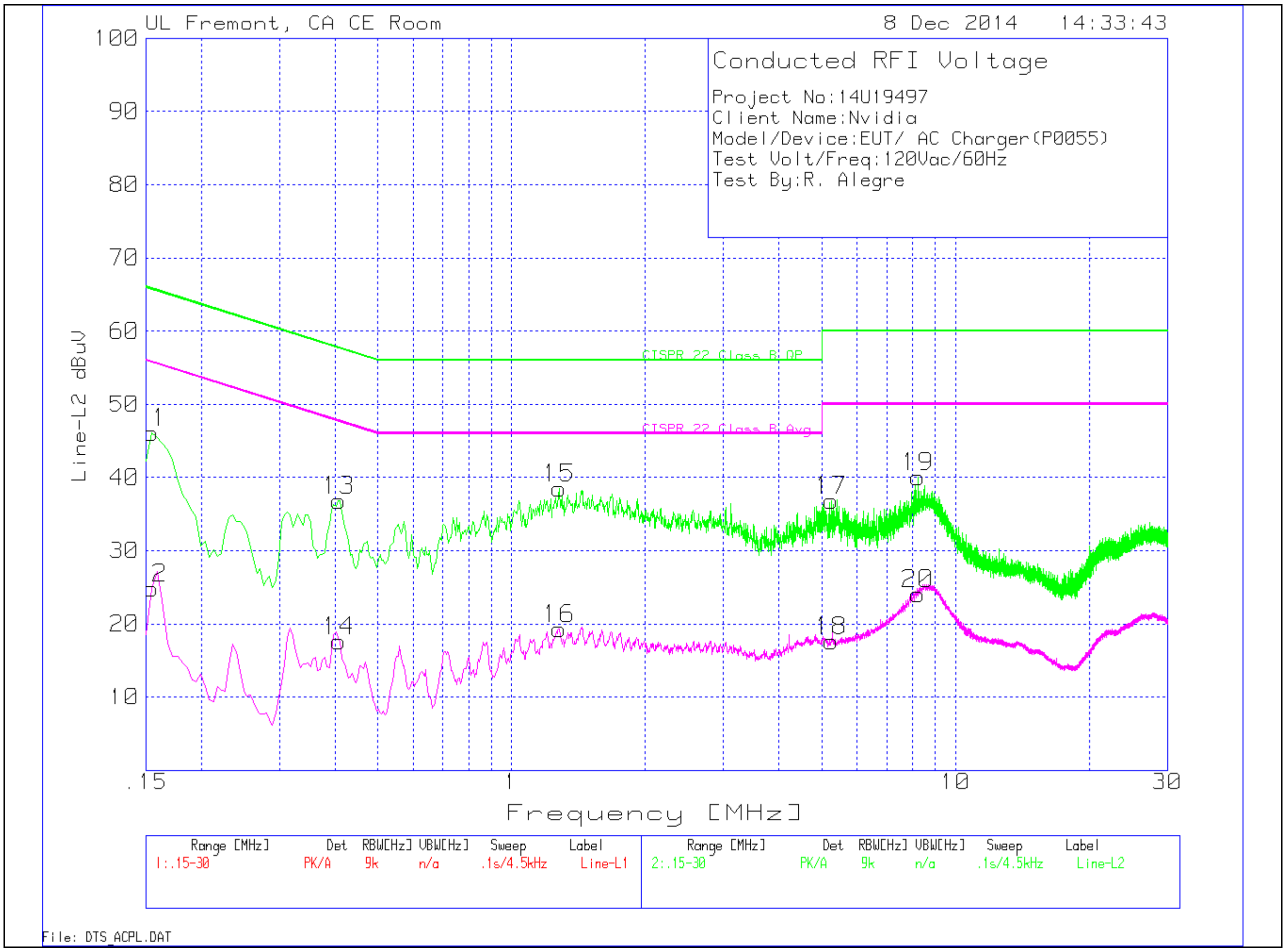
LINE 1 RESULTS

Line-L1 .15 - 30MHz

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1 (dB)	LC Cables 1&3 (dB)	Corrected Reading dBuV	CISPR 22 Class B QP	Margin to Limit (dB)	CISPR 22 Class B Avg	Margin to Limit (dB)
1	.159	53.34	PK	1.3	0	54.64	65.5	-10.86	-	-
2	.159	38.39	Av	1.3	0	39.69	-	-	55.5	-15.81
3	.4695	41.46	PK	.4	0	41.86	56.5	-14.64	-	-
4	.4695	29.74	Av	.4	0	30.14	-	-	46.5	-16.36
5	1.2255	41.78	PK	.2	.1	42.08	56	-13.92	-	-
6	1.2255	27.06	Av	.2	.1	27.36	-	-	46	-18.64
7	5.199	38.92	PK	.2	.1	39.22	60	-20.78	-	-
8	5.199	20.32	Av	.2	.1	20.62	-	-	50	-29.38
9	25.206	36.09	PK	.3	.3	36.69	60	-23.31	-	-
10	25.206	24.16	Av	.3	.3	24.76	-	-	50	-25.24

LINE 2 PLOT



Conducted RFI Voltage

Project No:14U19497
Client Name:Nvidia
Model/Device:EUT/ AC Charger(P0055)
Test Volt/Freq:120Vac/60Hz
Test By:R. Alegre

Range [MHz]	Det	RBW[Hz]	VBW[Hz]	Sweep	Label	Range [MHz]	Det	RBW[Hz]	VBW[Hz]	Sweep	Label
1:.15-30	PK/A	9k	n/a	.1s/4.5kHz	Line-L1	2:.15-30	PK/A	9k	n/a	.1s/4.5kHz	Line-L2

File: DTS_ACPL.DAT

LINE 2 RESULTS

Line-L2 .15 - 30MHz

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2 (dB)	LC Cables 2&3 (dB)	Corrected Reading dBuV	CISPR 22 Class B QP	Margin to Limit (dB)	CISPR 22 Class B Avg	Margin to Limit (dB)
11	.1545	44.67	PK	1.4	0	46.07	65.8	-19.73	-	-
12	.1545	23.47	Av	1.4	0	24.87	-	-	55.8	-30.93
13	.40875	36.47	PK	.4	0	36.87	57.7	-20.83	-	-
14	.40875	17.18	Av	.4	0	17.58	-	-	47.7	-30.12
15	1.2795	38.17	PK	.2	.1	38.47	56	-17.53	-	-
16	1.2795	18.96	Av	.2	.1	19.26	-	-	46	-26.74
17	5.244	36.49	PK	.2	.1	36.79	60	-23.21	-	-
18	5.244	17.31	Av	.2	.1	17.61	-	-	50	-32.39
19	8.241	39.74	PK	.2	.1	40.04	60	-19.96	-	-
20	8.241	23.79	Av	.2	.1	24.09	-	-	50	-25.91

PK - Peak detector

Av - average detection

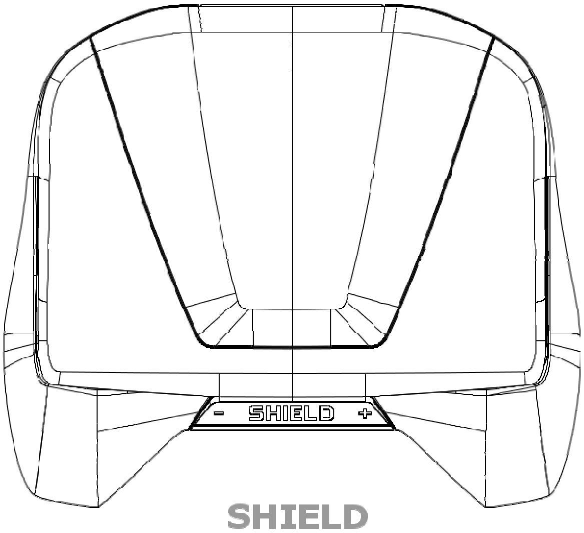
ABOUT SHIELD PORTABLE

Thank you for choosing the NVIDIA SHIELD portable. SHIELD portable lets you:

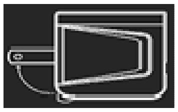
- **Enjoy Android in high-res**. Built on Android TV, SHIELD portable delivers 4K entertainment, including video, music, apps and more on a stunning 5.66-inch 1440x810 high-definition display.
- **Play next-gen Android games**. SHIELD is powered by our new Tegra X1 chip and lets you enjoy hundreds of SHIELD-optimized games and exclusive titles like *Crysis 3*, *Doom 3*: *BFG*, and *Borderlands*: *TPS*.
- **Access a GeForce GTX supercomputer in the cloud**. SHIELD is the gateway to SHIELD X, giving access to both a subscription service loaded with favorite AAA titles and the ability to download new top titles - all at a resolution up to 1080p, at 60 frames per second, with very low latency.

IN THE BOX

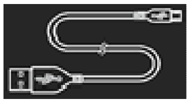
SHIELD portable comes with the following:



SHIELD



Adapter

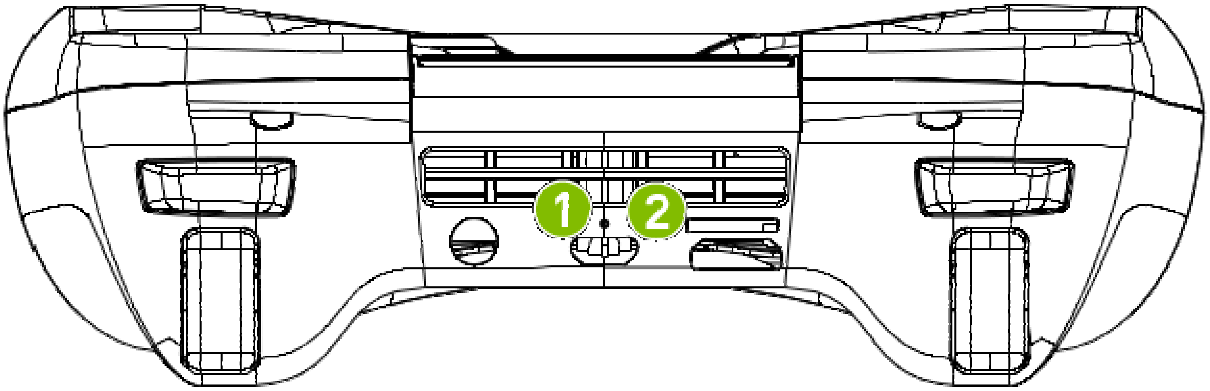


USB Cable

A Quick Start guide and Warranty, Safety and Regulatory booklet are also included.

CHARGING YOUR SHIELD PORTABLE

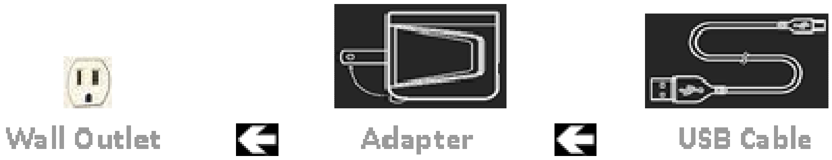
To charge your SHIELD portable, connect the included USB Cable to the micro-USB port on the back of the device. Connect the USB end to the adapter and plug the adapter into a wall outlet.



① Charge Indicator LED

② Micro-USB

- Amber: Charging
- Green: Charged



TIP For fastest charging time, NVIDIA recommends using the intended USB Cable and AC Adapter plugged into a wall outlet.

The SHIELD portable can also be charged by connecting the USB connector into a computer rather than into the AC adapter. However, it will charge faster connected to a wall outlet.

GET STARTED

Press the NVIDIA Button ▼ to power on the SHIELD portable. The SHIELD portable device tutorial walks you through a series of screens explaining basic button functions and overview functions. Use the A button to go through the SHIELD Welcome screens.

During the SHIELD welcome, you will be asked to accept NVIDIA Software License Agreement, Privacy Policy, and Tegra Experience Terms of Service legal information. To review the legal terms of service, go to: **Settings** > **About** > **Legal information** > **View Terms of Service.**

Once finished with the SHIELD Welcome, the Android TV Setup begins.

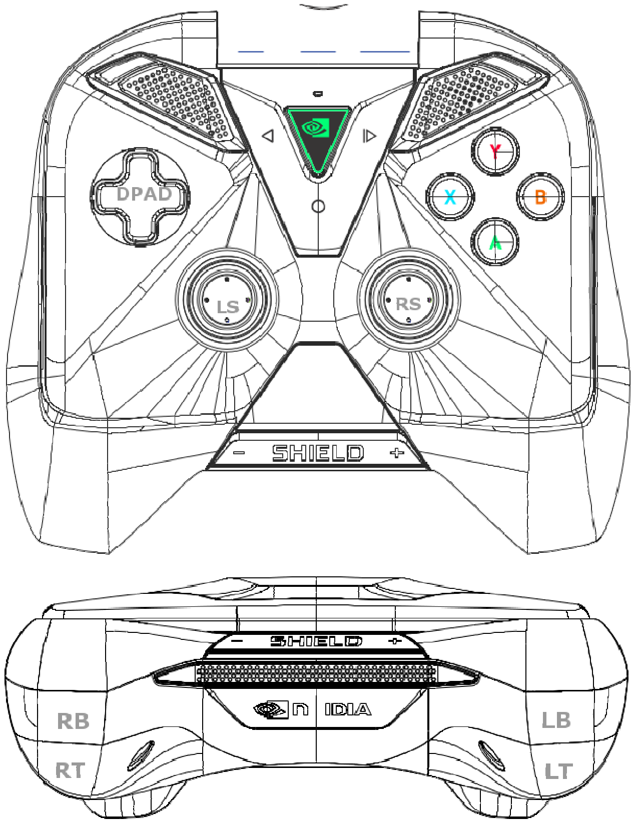
NOTE: It is a good practice to check for software updates even when you first purchase your SHIELD portable. Go to **Settings** > **About** > **System update** to download the latest software.

Upon completion of the SHIELD Welcome, you enter the standard Android TV setup process. During this process, you will configure the Android TV portion of the SHIELD portable device by setting up email account(s), configuring Wi-Fi access, and other functions.

The first screen displayed asks you to choose a language. If it is on your language, select **Start** to begin the setup. Otherwise, select your language from the list and then select **Start**. A series of screens takes you through the setup process. If you already have Gmail, use your Gmail address and password when asked. If you do not have Gmail or any other Google Account, you can create one during setup. As you go through the setup screens, you have the option to skip some steps. To set up options you skipped, or for more information, see Settings.

NAVIGATING SHIELD PORTABLE

To navigate through the menus and apps use the following SHIELD portable game controls.



▽	**NVIDIA Button.** Turns SHIELD device ON, displays power menu to turn device OFF, put SHIELD to sleep, go to Airplane mode, or connect to a TV via Miracast.
○	**Home Button.** Opens the Android Home screen. Double Press to view icons of Recent Apps. Long Press to open Google Now.
▷	**Start Button.**
	Volume Rocker. Press **-/+** to decrease/increase volume. Long-press the **-** button to mute.
◁	**Back.** Jumps to the previous screen or activity.
A	**A Button.** Activates the selected item in most apps.
B	**B Button.** Back or cancel in most apps.

X	**X Button**
Y	**Y Button.** Opens menu in most apps.
LS	**Left Stick**
RS	**Right Stick**
✚	**D-Pad**
LB	**Left Bumper**
LT	**Left Trigger**
RB	**Right Bumper**
RT	**Right Trigger**

Advanced Functions

Boot Up: Press the NVIDIA ▼ button when the device is powered off to boot the device.

Boot Menu: Hold down Volume - and LS, then press ▼.

Power Menu: Long hold ▼.

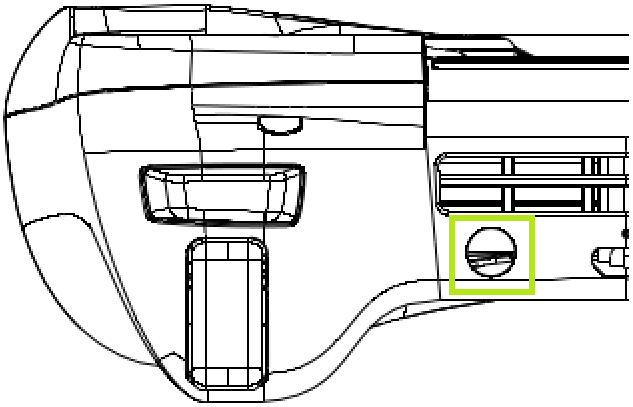
Power Off: Long hold (6 seconds) ▼ to power off device.

Share: Press ▼.

Home: Press ○ to open Android home.

USING A HEADSET

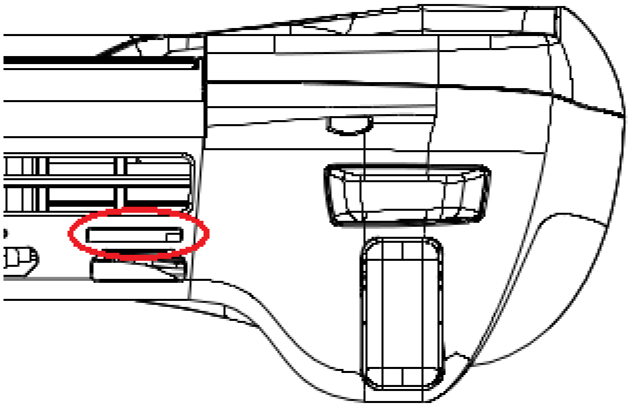
SHIELD portable has a connection on the back of the device to plug in headphones/headset (with microphone) or speakers. The SHIELD portable also supports Bluetooth headphones/headset and speaker devices.



To connect Bluetooth devices, go to **Settings** → **SHIELD accessories** →**Connect accessory** and pair the device to the SHIELD portable.

HOW TO USE A MICRO SD CARD

SD Cards are small memory cards that you can read, write, and delete data on. They are available in three sizes: standard SD, mini SD, and micro SD (or *microSD*). SHIELD portable has a slot on the back of the device for a *microSD* card. The card can be loaded with music, pictures, and videos as well as game and app files to free-up space on the SHIELD portable internal storage drive.



- **32GB (or less) *microSD* cards** - SHIELD portable supports FAT32 data format. Most *microSD* cards that are 32 GB or less are already formatted as FAT32. If the memory card is not formatted, format to FAT32, using your PC or Mac computer.

- **64GB (or higher) *microSD* cards** - Android does not support the exFAT file system out-of-the-box. Because the standard FAT32 file system does NOT support partitions greater than 32 GB by default, 64 GB cards come pre-formatted as exFAT. If you want to use a 64 GB *microSD* with SHIELD portable, it has to be converted to a file system format that is supported by stock Android, which in this case is NTFS. Format the 64 GB *microSD* card to NTFS using your PC or Mac computer.

How to Move Data to SD Card

- **Games and Apps**
- Go to **Settings** ➔ **Apps**
- Select an App/Game to be moved
- Select **Move App To SDCard**
- Select **OK** to move the game/app.

The ability to move data to the SD card is dependent on the selected app or game. Only apps/games that the developers have opted in as *moveable to external storage* can be moved.

SHIELD SETTINGS

SHIELD will automatically go to sleep after 30 minutes of inactivity. To change this default, go to Settings > Device > Display > Daydream > When to sleep.

To immediately put SHIELD to sleep, tap the NVIDIA Button on SHIELD.

To wake SHIELD, tap the NVIDIA Button on SHIELD or tap the NVIDIA Button on SHIELD controller.

In certain situations, you may need to restart SHIELD.

To restart:

1. Hold the NVIDIA Button on SHIELD for 9 seconds.
2. Tap the NVIDIA button to turn SHIELD back on.

SAFETY INFORMATION

NVIDIA products are designed to operate safely when installed and used according to the product instructions and general safety practices. The guidelines included in this document explain the potential risks associated with equipment operation and provide important safety practices designed to minimize these risks. By carefully following the information contained in this document, you can protect yourself from hazards and create a safer environment.

This product is designed and tested to meet IEC 60950-1, the Standard for Safety of Information Technology Equipment. This also covers the national implementation of IEC 60950-1 based safety standards around the world e.g. UL 60950-1. These standards reduce the risk of injury from the following hazards:

> Electric shock: Hazardous voltage levels contained in parts of the product
> Fire: Overload, temperature, material flammability
> Mechanical: Sharp edges, moving parts, instability
> Energy: Circuits with high energy levels (240 volt amperes) or potential as burn hazards
> Heat: Accessible parts of the product at high temperatures
> Chemical: Chemical fumes and vapors

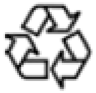
> Radiation: Noise, ionizing, laser, ultrasonic waves

Retain and follow all product safety and operating instructions. Always refer to the documentation supplied with your equipment. Observe all warnings on the product and in the operating instructions.

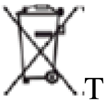
Note: Read all safety information below and operating instructions before using NVIDIA® SHIELD™ to avoid injury.

⚠ **WARNING:** FAILURE TO FOLLOW THESE SAFETY INSTRUCTIONS COULD RESULT IN FIRE, ELECTRIC SHOCK OR OTHER INJURY OR DAMAGE. ELECTRICAL EQUIPMENT CAN BE HAZARDOUS IF MISUSED. OPERATION OF THIS PRODUCT, OR SIMILAR PRODUCTS, MUST ALWAYS BE SUPERVISED BY AN ADULT. DO NOT ALLOW CHILDREN ACCESS TO THE INTERIOR OF ANY ELECTRICAL PRODUCT AND DO NOT PERMIT THEM TO HANDLE ANY CABLES.

SYMBOLS ON EQUIPMENT



This is a universal recycling symbol. A product marked with this symbol can be recycled if the regulations and/or ordnances of the local community provide for its collection.



This is a universal recycling symbol indicating that the battery cannot be disposed of in the trash and must be recycled according to the regulations and/or ordnances of the local community.

To reduce the risk of electric shock, personal injury, or damage to the equipment, observe the following precautions:

> Follow all cautions and instructions marked on the equipment.
> Do not bend, drop, crush, puncture, incinerate, or push objects into openings of SHIELD™.
> Do not connect or disconnect any cables or perform maintenance or reconfiguration of this product during an electrical storm.
> Do not use SHIELD™ in rain or near sink, or other wet locations. Take care not to spill any food or liquid into the device. In case SHIELD™ gets wet, unplug all cables and turn off before cleaning, and allow it to dry thoroughly before turning it on again.
> Do not expose SHIELD™ to any gas which is not normally contained in the atmosphere, it may cause defects.
> Never turn on any equipment when there is evidence of fire, water, or structural damage.
> Place the product away from radiators, heat registers, stoves, amplifiers, or other appliances that produce heat.
> Never force a connector into a port. Check for obstructions on the port. If the connector and port don't join with reasonable ease, they probably don't match. Make sure that the connector matches the port and that you have positioned the connector correctly in relation to the port.
> Always use an NVIDIA approved power adapter and refer to the manufacturer's instructions or equipment manual for proper instructions. Do not connect or disconnect the AC Power Adapter with wet hands. The power adapter is intended for indoor use only.
> Operate the AC adapter in a ventilated area.
> When you are using SHIELD™ or charging the battery, it is normal for the system and/or AC power adapter to get warm. Always unplug *SHIELD Portable* when fully charged to save unnecessary power consumption.
> Do not use conductive tools that could bridge live parts.
> Do not make mechanical or electrical modifications to the equipment.
> Never attempt to repair SHIELD™ yourself. This device does not contain any user-serviceable parts. Do not attempt to open, disassemble, or remove the battery. You run the risk of electric shock.
> *SHIELD portable:* To clean the display, use a soft, lint-free cloth. If necessary, breathe upon the display surface and wipe off immediately and softly. Avoid getting moisture in openings. Don't use window cleaners, household cleaners, aerosol sprays, solvents, alcohol, ammonia, or abrasives to clean the display.
> Operate SHIELD™ in a place where the temperature is always between 5 and 30°C (41 to 86°F).
> Store SHIELD™ in a place where the temperature is always between 0 and 35°C (32 to 95°F) with a relative humidity of 70% or lower. When taking the device from a low temperature condition, allow the device to reach room temperature before turning the power on.
> Use this product only with approved equipment and/or accessories

> If the product sustains damage requiring service, disconnect the product from the AC electrical outlet and refer servicing to an NVIDIA authorized service provider.

HEADSET/EARPHONE VOLUME LEVEL NOTICE

WARNING: TO PREVENT POSSIBLE HEARING DAMAGE, DO NOT LISTEN AT HIGH VOLUME LEVELS FOR LONG PERIODS.

LITHIUM BATTERY NOTICE

WARNING: SHIELD portable, SHIELD remote, and SHIELD controller CONTAIN A NON-USER-SERVICEABLE LITHIUM-ION BATTERY PACK. THERE IS RISK OF EXPLOSION, FIRE, BURN OR LEAKING WHICH CAN BE CAUSED BY IMPROPER CHARGING, SHORTING OF THE BATTERY PACK, CRUSH DAMAGE OR OTHER MISUSE. ALWAYS USE CHARGERS DESIGNED SPECIFICALLY FOR USE WITH THIS DEVICE. DO NOT ATTEMPT TO DISASSEMBLE, REPLACE, OR OTHERWISE ATTEMPT TO ACCESS THE BATTERY PACK. CONTACT CUSTOMER SUPPORT FOR REPAIR OR REPLACEMENT INFORMATION. RECYCLE THE DEVICE ACCORDING TO LOCAL RULES AND REGULATIONS. CONTACT YOUR LOCAL WASTE DISPOSAL/RECYCLE FACILITY.

POWER RATING

SHIELD portable (P2523)
5-16 VDC, 2 A

COMPLIANCE

The NVIDIA SHIELD Portable is compliant with the regulations listed in this section. Compliance marks, including the FCC and IC ID numbers, can be found on SHIELD Portable by go to Settings > About > Regulatory Information

UNITED STATES

Federal Communications Commission (FCC)

FCC ID: VOB-P2523

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including any interference that may cause undesired operation of the device.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Warning: The FCC requires that you be notified that any changes or modifications to this device not expressly approved by the manufacturer could void the user’s authority to operate the equipment.

Caution: Within the 5.15 to 5.25 GHz band (5 GHz radio channels 34 to 48) this device is restricted to indoor operations to reduce any potential for harmful interference to co-channel Mobile Satellite System (MSS) operations.

RF Radiation Exposure Statement:

SHEILD Portable has been tested and complies with FCC RF radiation exposure limits set forth for an uncontrolled environment when used with the NVIDIA accessories supplied or designated for this product. During testing, SHIELD Portable was placed in positions that simulate use against the body. The use of any other accessories may not ensure compliance with FCC RF exposure guidelines.

Underwriters Laboratories (UL)

c UL US
LISTED
I.T.E E204896

CANADA

Industry Canada (IC)
IC: 7361A-P2523
CAN ICES-3(B)/NMB-3(B)
This device complies with RSS-210 of the Industry Canada Rules. Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.
Ce dispositif est conforme à la norme CNR-210 d'Industrie Canada applicable aux appareils radio exempts de licence. Son fonctionnement est sujet aux deux conditions suivantes: (1) le dispositif ne doit pas produire de brouillage préjudiciable, et (2) ce dispositif doit accepter tout brouillage reçu, y compris un brouillage susceptible de provoquer un fonctionnement indésirable.

RF Radiation Exposure Statement:
SHIELD Portable has been tested and complies with IC RSS 102 RF radiation exposure limits set forth for an uncontrolled environment when used with the NVIDIA accessories supplied or designated for this product. During testing, SHIELD Portable was placed in positions that simulate use against the body. The use of any other accessories may not ensure compliance with IC RSS 102RF exposure guidelines.
Déclaration d'exposition aux radiations:
La SHIELD Portable a ete testee conformemment aux normes d’exposition d’emission RF de la IC RSS 102 pour un environement non controle lors d’utilisation avec les accessoires fournis or recommendes par NVIDIA. Pendant les tests, SHIELD Portable a ete positionnee afin de simule la presence du corps humain. L’utilisation d’accessoires autres que ceux recommendes par NVIDIA ne guarantis pas la compatibilite avec les normes d’emission RF de la IC RSS 102.

EUROPEAN UNION

European Conformity; Conformité Européenne (CE)

This device bears the CE mark and class-2 identifier in accordance with Directive 1999/5/EC

This device complies with the following Directives:
R&TTE Directive for radio equipment
Low Voltage Directive for electrical safety
RoHS Directive for hazardous substances

A copy of the Declaration of Conformity to the essential requirements may be obtained directly from NVIDIA GmbH (Floessergasse 2, 81369 Munich, Germany).

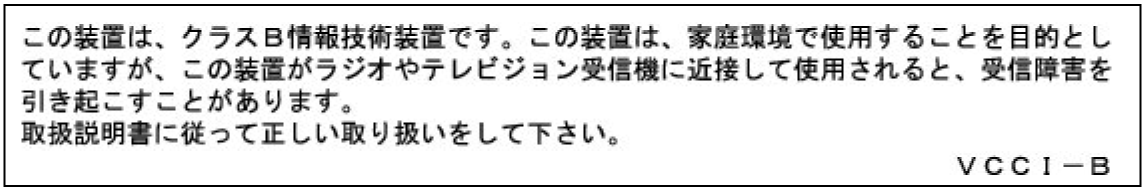
AUSTRALIA AND NEW ZEALAND

Australian Communications and Media Authority (RCM)

This product meets the applicable EMC requirements for Class B, I.T.E equipment and applicable radio equipment requirements

JAPAN

Voluntary Control Council for Interference (VCCI)



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取扱説明書に従って正しい取り扱いをして下さい。

ＶＣＣＩ－Ｂ

Radio/ Telecommunications Certification

R 007-AD0055

W52/W53 are indoor use only

SOUTH KOREA

Radio Research Agency (RRA)

Korean Agency for Technology and Standards (KATS)

MSIP-CMM-NVA-P2523

B급 기기 (가정용 방송 통신기자재)	이 기기는 가정용(B급) 전자파적합기기로서 주로 가정에서 사용하는 것을 목적으로 하며, 모든 지역에서 사용할 수 있습니다.

TAIWAN

National Communications Commission

國家通訊傳播委員會

CCAJ15LP1400T1

注意！

依據 低功率電波輻射性電機管理辦法

第十二條

經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

第十四條

低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。

前項合法通信，指依電信法規定作業之無線電通信。

低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

在5.250~5.350GHz頻帶内操作之無線資訊傳輸設備，限於室内使用

RUSSIA/KAZAKHSTAN/BELARUS

EurAsian Customs Union

This device complies with the technical regulations of the Customs Union (CU TR)
This device complies with the rules set forth by Federal Agency of Communications and the Ministry of Communications and Mass Media
Federal Security Service notification has been filed.

SINGAPORE

Complies with
IDA Standards
DA00006A

BLUETOOTH

Bluetooth v4.1 LE
Declaration ID: D022779
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WI-FI ALLIANCE®

Wi-Fi CERTIFIED™

Certification ID: WFA58412
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